$$W(\text{work done in the spring}) = \int_{y=0}^{y=y} Ky \cdot \frac{K}{2} y^2$$

$$= \frac{P L^3}{3EI}$$

$$\frac{EI}{L^3} = \frac{P}{f} = K = \frac{3\pi E d^4}{L^3}$$

$$K = \frac{3\pi (30 \times 10^6 \text{ lb/in}^2)(.4)^4}{9} = 11,520 \text{ lb/in.}$$

$$\frac{(11,520 \text{ lb/in})(.707)^2}{2} = 2.88 \text{ in-lbs.}$$

$$\frac{2.01 \text{ in-lbs}}{2.88 \text{ in-lbs}} = .698 = 70\%$$

$$\theta = \frac{2(32)}{\left[\frac{(.4)(.75)}{1.17}\right]^2} = \left[\frac{2}{.256}\right]^{\frac{1}{2}} = 1.56 \text{ radians}$$

$$= 89.4^\circ$$

of the two functions served the stated purpose: (1) firstly, it serves to stop the motion of Drum #2 with respect to Drum #1 when black-and-white viewing is intended, and (2) it is the means by which Drum #1 is motivated along with Drum #2 for color viewing. In stopping Drum #2 after Drum #1 has already been positioned, it must absorb the kinetic energy of Drum #2 (the moving mass), since E_{mv^2} for Drum #2 is taken from Drum #1 (the stationary mass). Thus,

$$\left(\frac{(5.5\ \text{lb-ft}^2)}{(2)\left(32\ \frac{\text{ft}}{\text{sec}^2}\right)}\right)(2\pi\ \text{rad/sec})^2 = 0.172\ \text{ft-lbs}.$$

Of course, this value is obtained by virtue of the fact that a mechanical stop is provided. Drum #1, the stationary mass, must have a mechanical stop provided for it. Otherwise, it would [illegible] equal to

$$\frac{(\quad)}{(\quad)} = 0.71\ \text{ft-lbs}$$

or

$$(\quad)\left(\frac{\quad}{\quad}\right) = 0.43\ \text{ft-lbs}$$

[illegible] about a 15° radius [illegible]

$$\frac{\quad}{\quad}$$

[illegible] Drum #2, this would mean the [illegible]

$$(\quad) = \quad \text{ft-lbs}$$

[illegible] further computations. [illegible] Drums are [illegible] Drum #2 [illegible] color viewing [illegible]

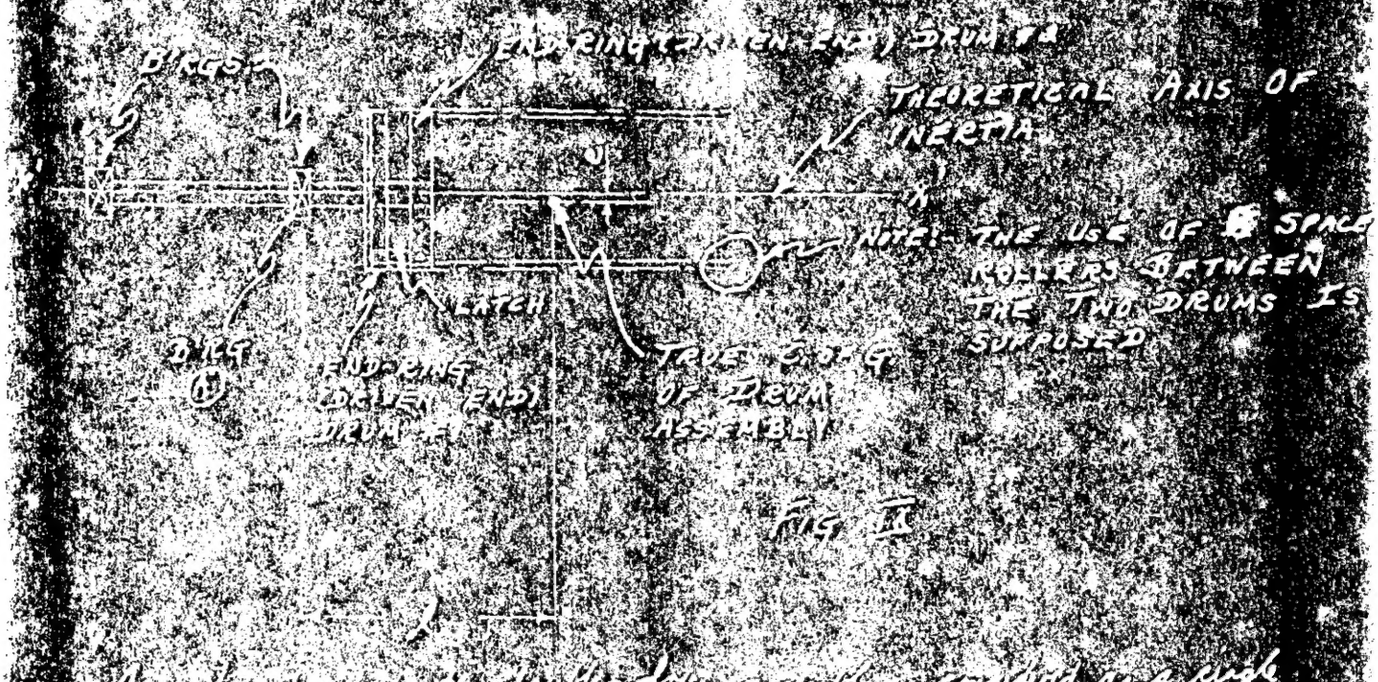

BIGGER
SMALLER
THEORETICAL AXIS OF INERTIA
NOTE: THE USE OF SPACE ROLLERS BETWEEN THE TWO DRUMS IS SUPPOSED
DRIVE (1)
DRIVEN (2)
TRACE OF PLANE OF ASSEMBLY

FIG. 11

[illegible]

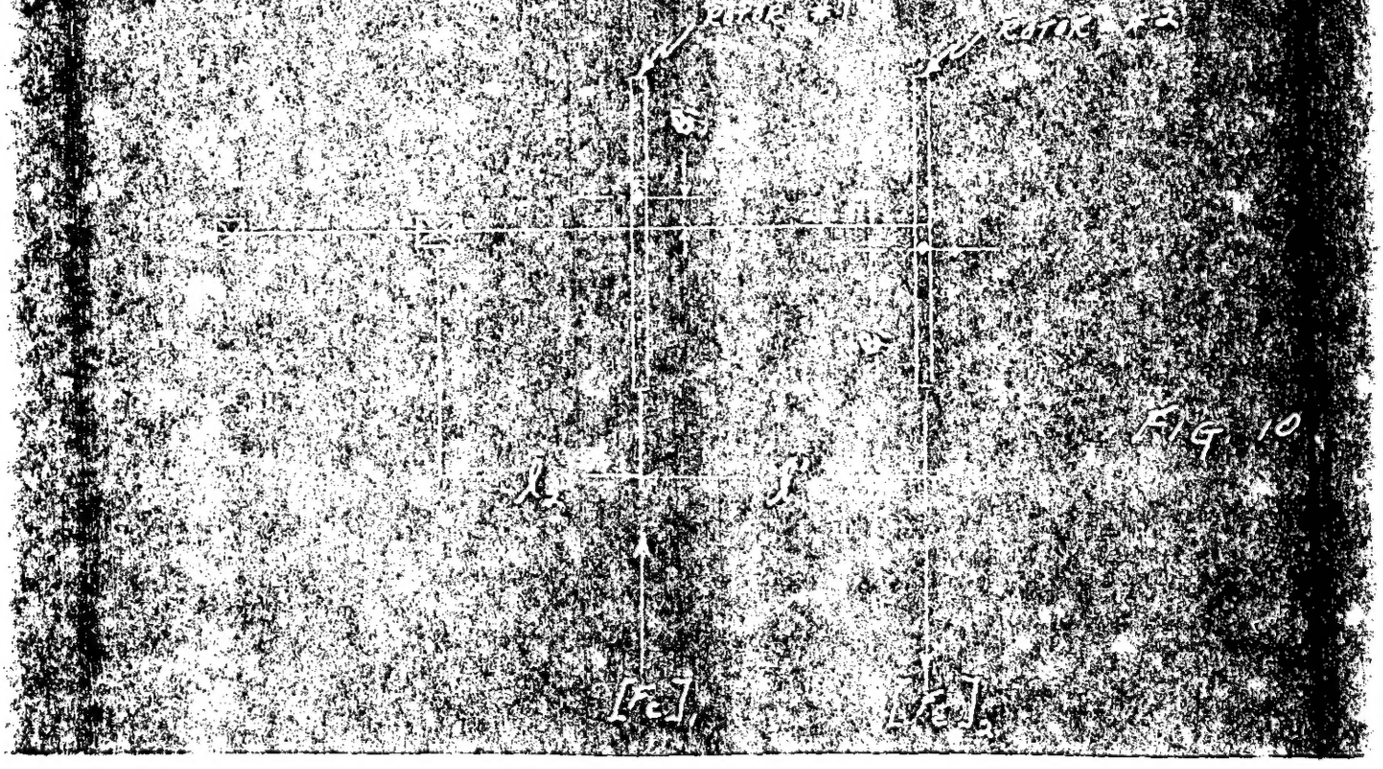
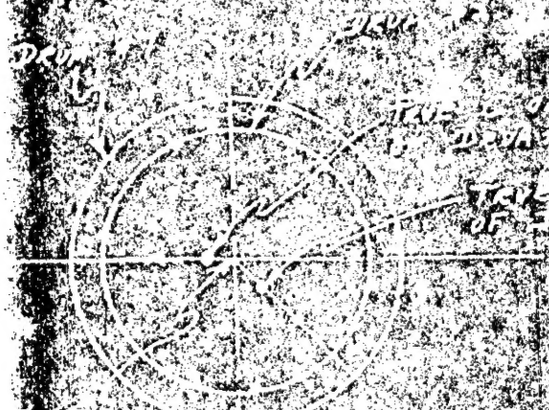


FIG. 10

[illegible]



3. [illegible] above is, funda-
[illegible] and adequate
[illegible] to the velo
[illegible] the right to carry
[illegible] loads.
[illegible] carrying two
[illegible] Here is
[illegible] (assuming
[illegible] fabricated
[illegible] below). He
[illegible] Abstract or Logic, 10

[illegible] the situation in
[illegible] identical weights
[illegible] identical weights
[illegible] oppositely offset identica
[illegible] mounted on the

[illegible] the situation
[illegible] identical
[illegible] identical
[illegible] in different
[illegible] eccentricities
[illegible] sent to centrif

[illegible] consequence of their
[illegible] obtained momen

[illegible] (A) to an
[illegible] (B) to a downward
[illegible] would present
[illegible] result in

and

$$F_2 = \frac{W}{g}(y_2 + e_1)\omega^2$$

Therefore, since

$$F_1 + F_2 = K y_2$$

we have

$$\frac{W}{g}(y_1 - e_1)\omega^2 + \frac{W}{g}(e_1 + y_2)\omega^2 = K y_2$$

which reduces to

$$\omega^2(y_1 + y_2) = \frac{K}{W} g y_2$$

$$\frac{\omega^2 y_1}{\frac{K}{W} g - \omega^2} = y_2 = \frac{y_1}{\left(\frac{K}{W\omega^2}\right) - 1}$$

Thus the amplitude (y_2) would attain infinite value when $\omega = \sqrt{\frac{Kg}{W}}$ and the vibration would become unstable. For values of ω greater than this, y_2 would be negative, and for values of ω greater than $\sqrt{\frac{2Kg}{W}}$ it would be greater than y_1. Thus, when ω is greater than $\sqrt{\frac{2Kg}{W}}$ the motion of the vibrator would be in the opposite direction from that of the foundation, while when ω is less than $\sqrt{\frac{Kg}{W}}$ the motion of the vibrator would be in the same direction as that of the foundation.

$$y_2 = \frac{y_1}{\frac{K}{W\omega^2} - 1}$$

If the vibrator is mounted on a floor, the floor will become [illegible] but to the extent that the floor is connected to the foundation, the floor would [illegible] the foundation. The floor [illegible] connecting the [illegible] the floor [illegible]

$= \frac{1}{2}[0.204 - \frac{1}{2}(0.134)] - [0.204 - 0.062]\,1/2 =$

$\frac{1}{2}[0.142] = 0.071$

$\Delta L = 0.071$

$V = 0.071$

$W = \frac{1}{2}(0.071)^2 + 0.43 = \frac{1}{2}(0.005) + 0.43 =$

$0.002 + 0.43 = 0.45$

$dL = 0.071^{1/2} + (0.071 + 0.43^{1/2})^{1/2} = 0.276 + (0.071 + 0.67)^{1/2}$

$= 0.276 + 0.741^{1/2} = 0.276 + 0.86 = 1.136''$

Check:

$dL + V\,dL - 0.43 = 0$

$1.06 - 0.71(1.06) - 0.43 = 0$

$1.06 - 0.76 - 0.43 = 0$

Check, Lee:

$L = \frac{1}{2}[h + (h + k^2)^{1/2}] + 1/2[h - (h + k^2)^{1/2}] =$

$= \frac{1}{2}[0.204] + \frac{1}{2}[-0.134] = 0.102 - 0.062 = 0.04$

$\Delta L = 0.04$

$V = 0.04$

$W = \frac{1}{2}(0.04)^2 + 0.43 = \frac{1}{2}(0.0016) + 0.43 =$

$0.0008 + 0.43 = 0.43$

$dL = 0.04^{1/2} + (0.04 + 0.43^{1/2})^{1/2} =$

$0.2 + (0.04 + 0.67)^{1/2} = 0.2 + 0.7^{1/2} =$

$0.2 + 0.835 = 1.035$

Check:

$dL + V\,dL - 0.43 = 0$

$1.035 + 0.04(1.035) - 0.43 = 0$

$1.035 + 0.041 - 0.43 = 0$

The [illegible] is taken to be within [illegible] of total unit accuracy; a
unit [illegible] & that [illegible] of the [illegible] check
and the [illegible] Number.

We previously found the stopped accelerating Diam to be of the order of 22.45 in. Using the "shock-torque" to be 1.5 times the value, according to Eq. 56 of "Shafting from a Dynamic Viewpoint",

$$d = 2.7\left[\frac{M_t}{S}\right]^{1/3} = 2.7\left[\frac{22.45(1.5)}{12(10^3)}\right]^{1/3} =$$

$$d = 2.7\left[\frac{33.675}{12}\right]^{1/3} = 2.7(1.15) = 0.521''$$

which should be increased to prevent more than a 1/2° deviation of the shaft. Finally, we find, by Eq. 58 of "Shafting From a Dynamic Viewpoint"

$$\frac{16M}{\pi d^3} = S$$

If [illegible] = 12,000 lbs/sq in. and d = 1.125" (or [illegible])

$$\frac{16(17)(20.25)}{\pi(1.25)^3} = \frac{(2.16)(5)}{\pi(1.25)} = 12.1 \text{ lbs/sq in.}$$

[illegible] the [illegible] and [illegible] from the combined [illegible] and bending moment [illegible]

$$[M^2 + T^2]^{1/2} = [(17)^2 + (10^4)^2]^{1/2} =$$

$$T = 10^4 \text{ in-lbs}$$

[illegible] the [illegible] of the shaft is the principle design [illegible] the [illegible] and the value of [illegible] speed which [illegible] [illegible] from a Dynamic Viewpoint" by [illegible] according

$$K = \frac{35}{l} = \frac{(6.8)(10^3)(11)(10.25)}{(6)(11)} =$$

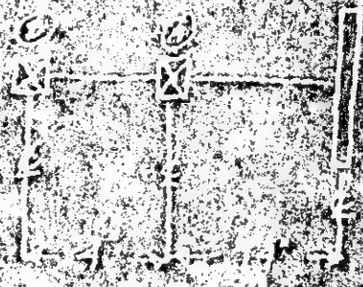
$$\frac{(12.6)(10^3)(11)(11.7)}{(6)(12.0)} = 22.10^3 \text{ lbs/in}$$

Then

$$\left[\frac{K}{M}\right]^{1/2} = \left[\frac{22.10^3(32.2)}{10.17}\right]^{1/2} = [8.3.0]^{1/2} = 914 \text{ oscillations per } 2\pi \text{ sec}$$

kg

$$f = \frac{c}{\frac{w}{2} - 1}$$



LAYOUT SKETCHES FOR 20" TUBE

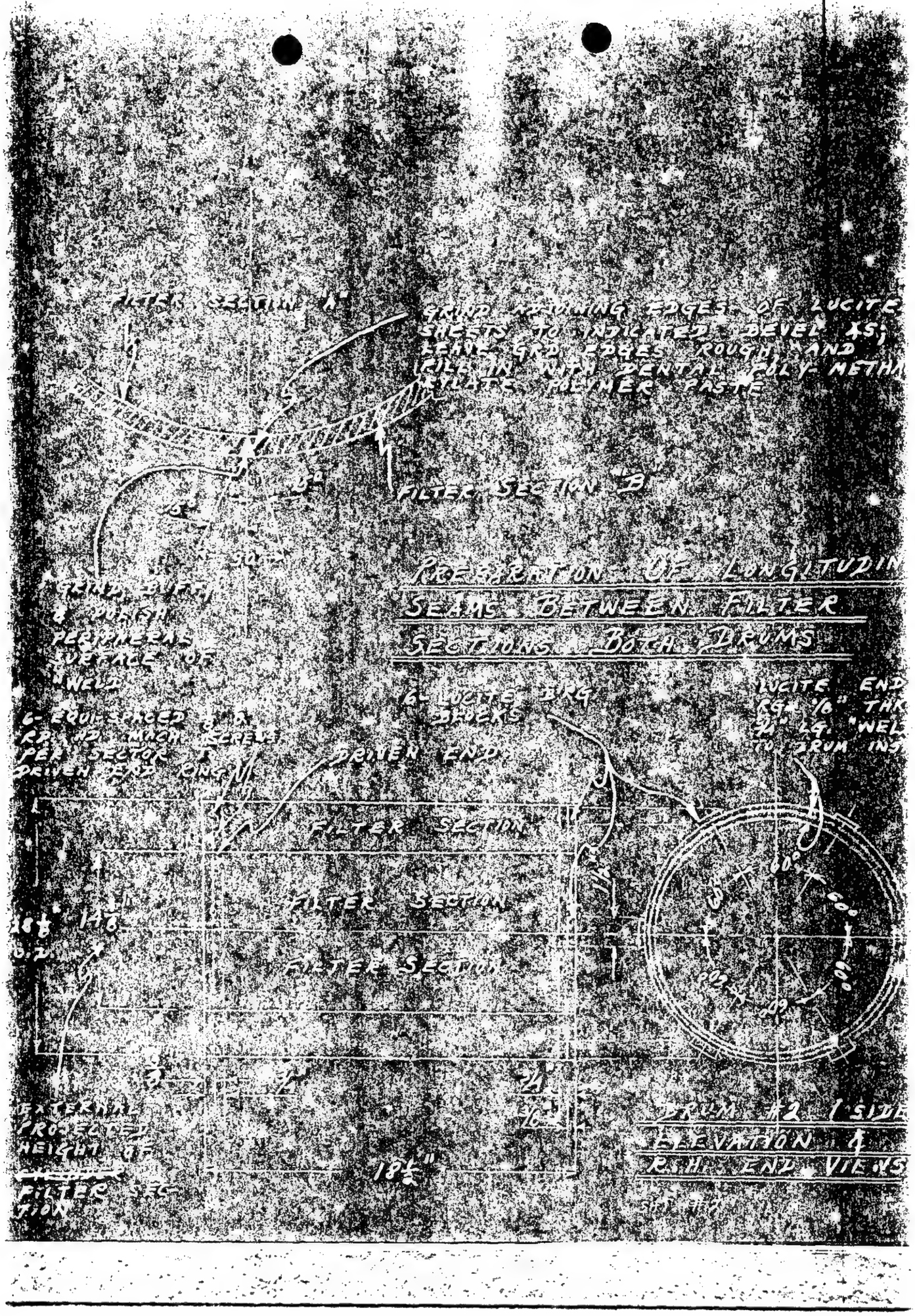
SCHEMATIC SHOWING ARRANGEMENT OF FLEX SECTORS ON DOUBLE DRUM ASSEMBLY

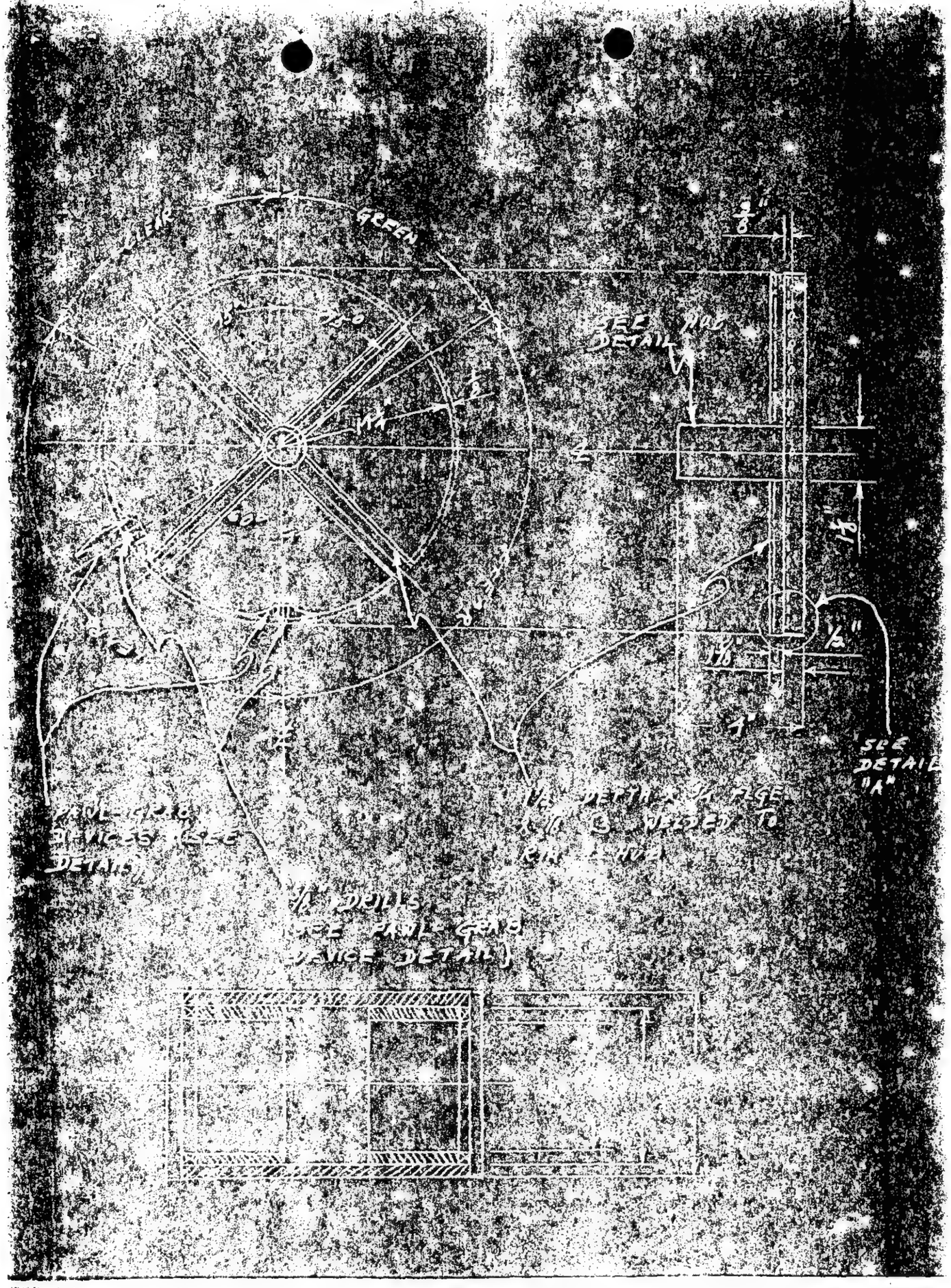
DIAMETRICAL HEIGHT OF PICTURE TUBE

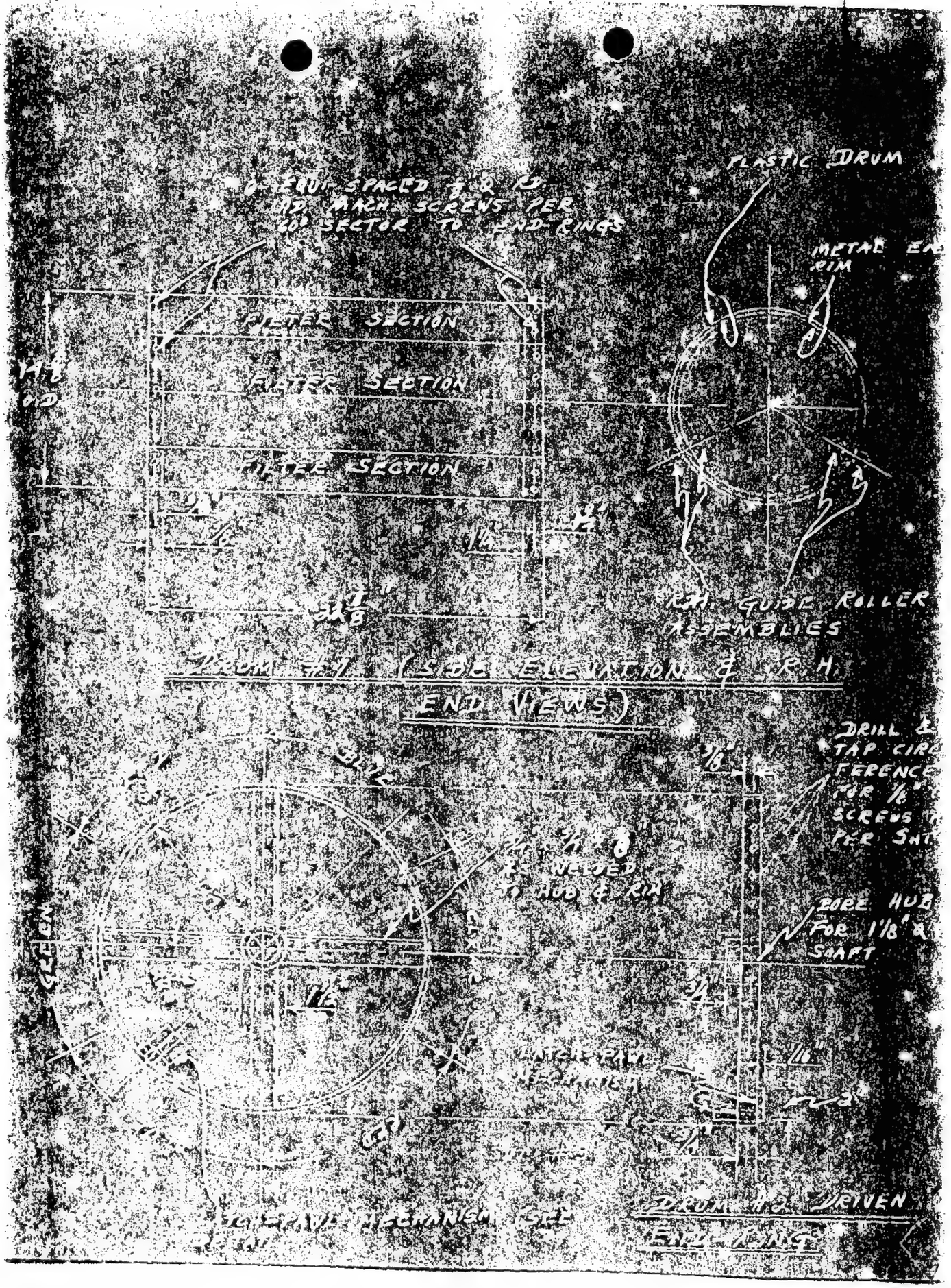
BLENDED ARC OF TUBE'S SURFACE

DIAMETRICAL PLASTIC DRUM VIEW

SAG #1

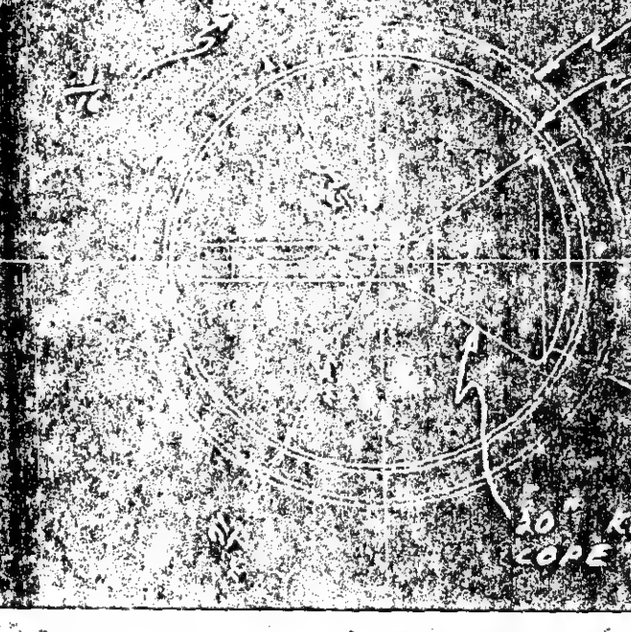

FILTER SECTION "A"
GRIND MATING EDGES OF LUCITE SHEETS TO INDICATED BEVELS; SEAL GRD EDGES ROUGH AND FILL W/ DENTAL POLY-METHA PLATE FILLER PASTE
FILTER SECTION "B"
PREPARATION OF LONGITUDIN SEAMS BETWEEN FILTER SECTIONS BOTH DRUMS
6 EQUI-SPACED HOLES PER SECTOR DRIVEN END
DRIVEN END
FILTER SECTION
FILTER SECTION
FILTER SECTION
LUCITE BRG BLOCKS
LUCITE END
60°
90°
DRUM #2 (SIDE
ELEVATION &
R.H. END VIEWS

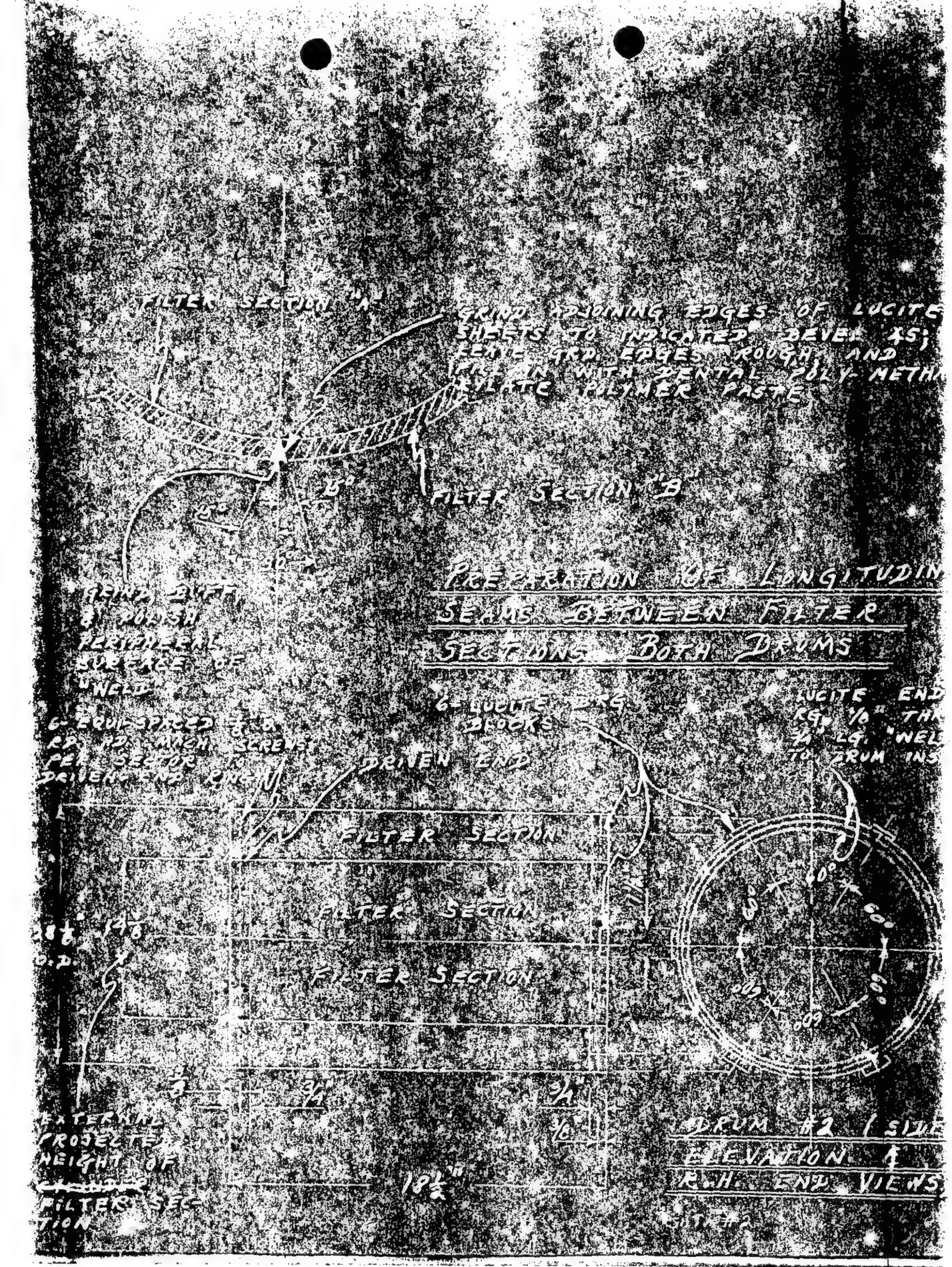

SCREEN
SEE DETAIL
SEE DETAIL "A"

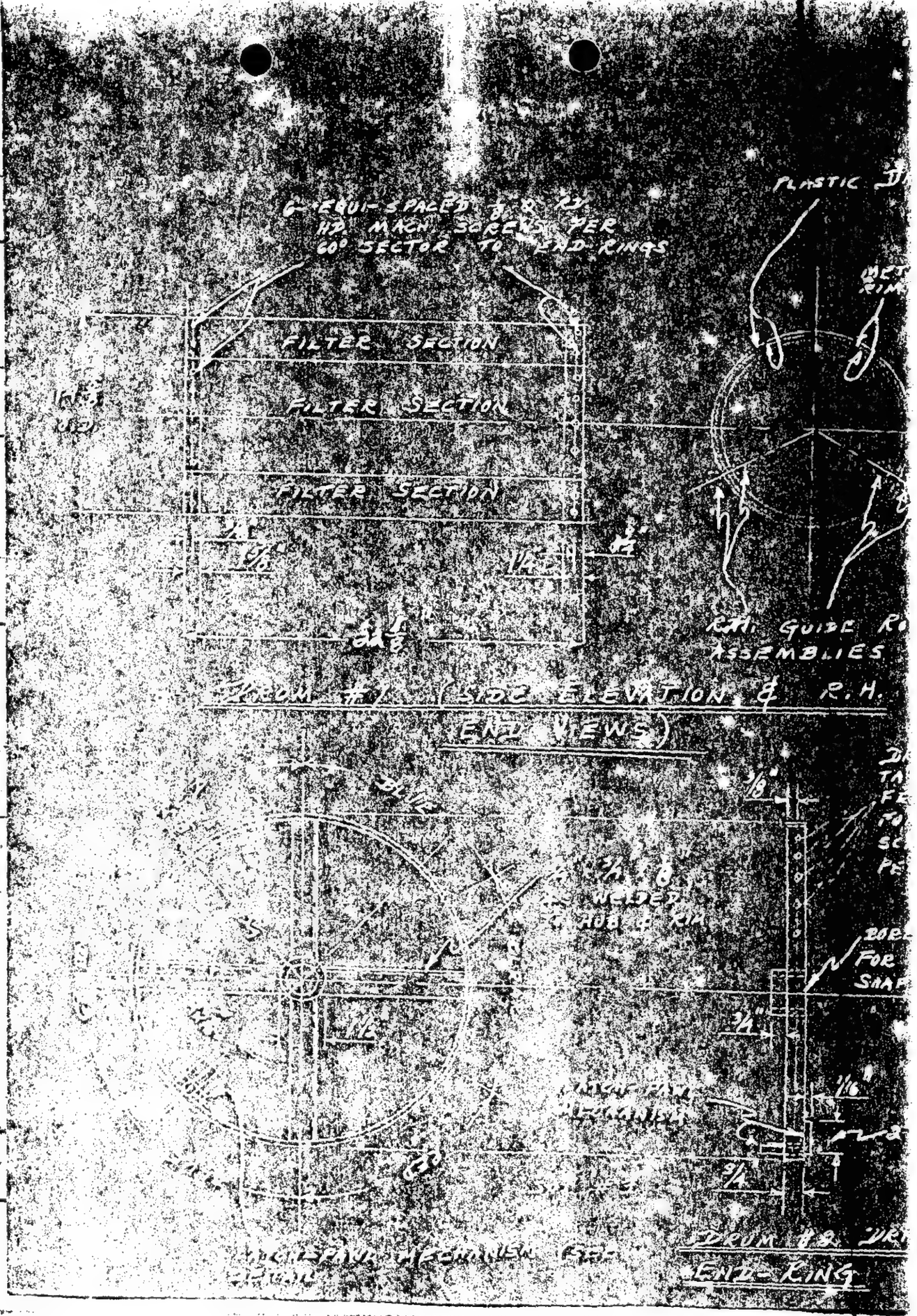

PLASTIC DRUM
METAL EN
RIM
SECTION
SECTION
SECTION
L.H. GUIDE ROLLER
ASSEMBLIES
END VIEWS)
DRILL &
TAP CIR
FERENCE
FOR 1/8
SCREWS
PER SH
BORE HUB
FOR 1 1/8
SHAFT
DRIVEN

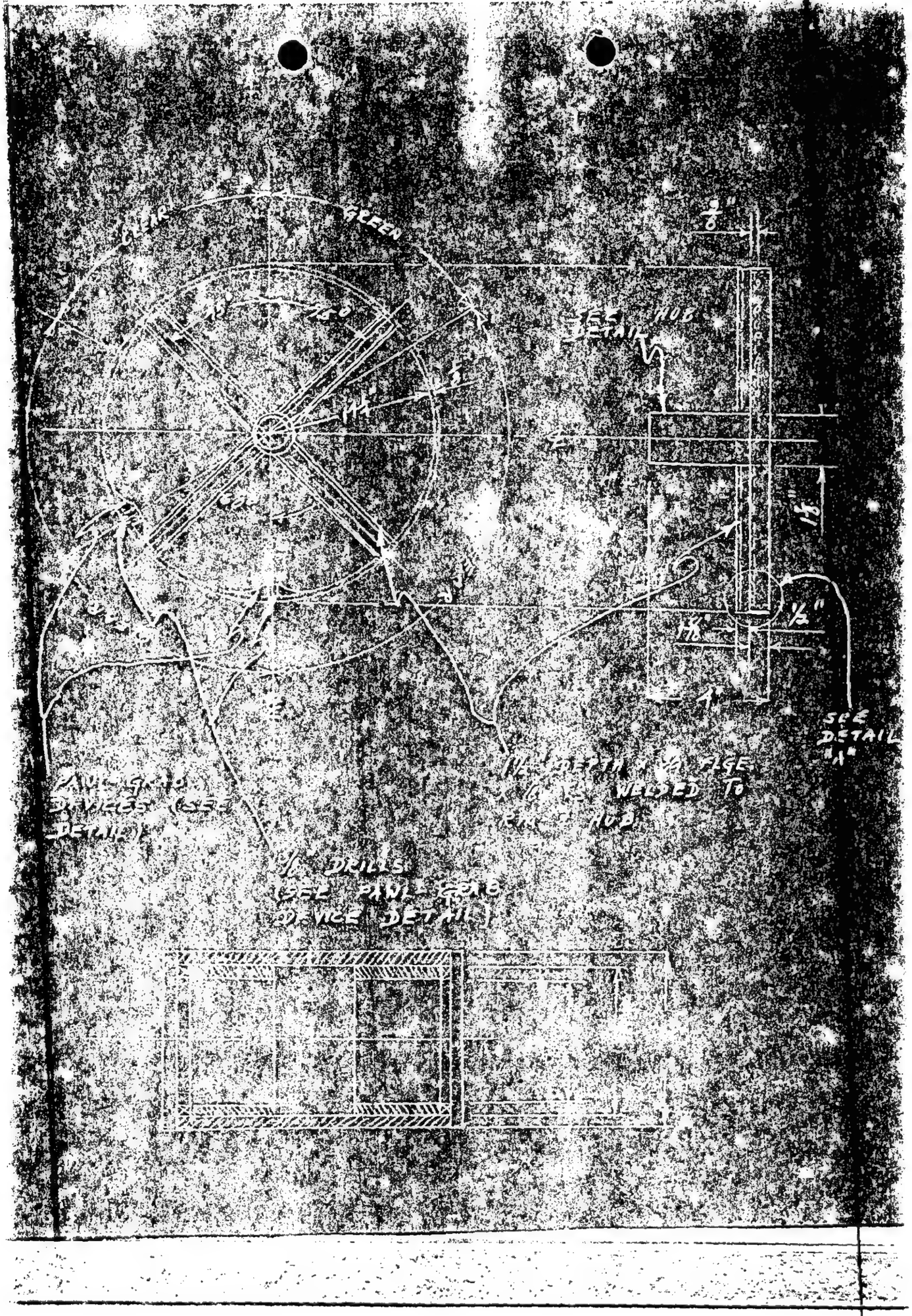
SKETCHES FOR 30" TUBE

SHOWING ARRANGEMENT OF PLASTIC SECTORS ON TUBE FACE




FILTER SECTION "A"
GRIND ADJOINING EDGES OF LUCITE
SHEETS TO INDICATED BEVEL AS
FENCE GRD EDGES ROUGH AND
IN WITH DENTAL POLY-METH
PLATE POLYMER PASTE
FILTER SECTION "B"
PREPARATION OF LONGITUDIN
SEAMS BETWEEN FILTER
SECTIONS BOTH DRUMS
6-EQUI-SPACED
PER SECTION
DRIVEN END
FILTER SECTION
FILTER SECTION
FILTER SECTION
DRUM #2
ELEVATION
END VIEWS


6 EQUI-SPACED 3/8" & 1/2" HD. MACH. SCREWS PER 60° SECTOR TO END RINGS
FILTER SECTION
FILTER SECTION
FILTER SECTION
PLASTIC
R.H. GUIDE
ASSEMBLIES
DRUM #1 (SIDE ELEVATION & R.H. END VIEWS)
WELDED HUB & RIM
DRUM #2
END RING


SEEN
SEE DETAIL
HUB
WELDED TO
SEE DETAIL
DRILLS
SEE PIN GAGE DEVICE DETAIL

To Joe F. Re [illegible] Job

Run a slip through [illegible]

Photostat same & [illegible]

Mail immediately [illegible] Port Jervis,

[illegible] & Mr. Norman

Send statement of [illegible] only

If he [illegible] or [illegible]

I [illegible] can't be [illegible] back, then

[illegible] Put down

[illegible] to get [illegible] appointment, in order

the statement

Call Norman to get [illegible] with statement

To Joe F. Re Projection Job

Go ahead and load projector.

Photostat same on previous returning photos

Mail immediately original to Port Jervis,

marked personal, att. Norman

Bring photostat copy of Sidney 102, only

If he [illegible] me a long [illegible]

I can't look over same until he comes back, the

[illegible] him. But I

like to get [illegible] time in, in

the photostat

Pd. Northeast Photo work started on this

FD-141
(1-13-48)

BULKY EXHIBIT

Date received 6/30/51

ABRAHAM BROTHMAN

100-95068-1B

(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained Warden E. E. Thompson

Address Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Ultimate disposition to be made of exhibit Retained

Estimated date of disposition - To be decided at conclusion of case

List of contents:

125. Two letters addressed to

OSCAR THALER,
45 Crosby Street
New York City

73

100-95068-1B

Liquidation Sale Satisfies Pathe

CHICAGO, June 24.—"Complete satisfaction" with results of the liquidation sale of 2 million dollars worth of Pathe and Freed-Eisemann television sets and radios was expressed today by Sidney Joffee, Pathe Television Corp., president.

"I'd bring what's left of the stock to the music show, but I don't expect to have much left," Mr. Joffee declared.

Meck Adds 14-Inch Model at $139.95

CHICAGO, June 18.—John Meck Industries has added a 14-inch picture tube television receiver to retail at $139.95, which was said by John S. Meck, president, to be $20 under the nearest competitive set in the industry.

The new set has a leatherette table-top cabinet similar to the company's earlier model 616T, 16-inch table set, and has a standard chassis with continuous tuner. The model, identified as MM-614-TL, is in production for immediate delivery.

"We are adding this low cost unit as a 'sales starter' for both distributors and retailers," Mr. Meck said.

Majestic Offers Special TV Deal To Retailers

Firm Giving Promotional Allowance on 17-Inch Sets

CHICAGO, June 21.—A new television buy was offered dealers this week by the Majestic Radio & Television division of the Wilcox-Gay Corp. Included in the special deal are a 17 inch leatherette table model and a 17 inch mahogany consolette, both 1951 models. According to Leonard Ashbach, Majestic president, who would not quote list prices of the sets, the dealers pay "regular prices" for the sets but receive a promotional allowance.

Mr. Ashbach reported that 2,000 units of the table model have been sold since the deal was offered Monday and "almost as many" units of the consolette.

The special offer will continue until 5,000 units of each set have been sold.

Lacy's, Washington, D. C., was one of the first takers of the field and Hudson-Ross, Chicago, also bought the sets. Quantities sold to these retailers could not be learned.

11

NORMAN (ret. 6/22) – Has ARTIC. LABELED "CBS-Columbia 25, ... Phonograph" – Retail 6/27/51 – Paragraph 4 ... the following way SIMPLY. Is there anything ... Let's get THIS IMMEDIATELY to leading Sample models ...

F.L. (re J.R., J.K., K.K., H.F.) – NOTE ARTICLE labeled "C.B.S.-C ... June Issue 25, re explanation this year" in Retail ... Issue Vanguard #6, last column. They say Hotel ... Sales, "but the firm will not distributors liability ... limitations by the manufacturer. ...

NORMAN, S. (re 6/22) – Don't ingrain your ... for signing quit like the Union Jackson ... I want only the Vanguard artists who are worthy ... to be listed by collectors. Little unscrupulous ... know. The only one to be with the complete ... NORMAN + SCHOZ. The first that has ... right quiet (Judy shouting she must off) ... limited label. He was + so crowded some ... he upset. Hope that anyone will refer to the ... project as the "operation eyes". ...

F.L. (mail) How many of the air conditioning units ... files on you MAY get somebody started Monday? ... get the [illegible] How does Stanwell ... Kramer? When the [illegible] man? When ... Sea Nymphs Skipper + Air Conditioning units ... WANT LATEST with MORE cooling? Bud ... back? Kojac Brents Mort. at 6pm? Ble of Brents ... How's AARON MATH. Business?

E.A. – Confirming previous note, please come on Sat. afternoon. Leave not later than 1 PM – Too much traffic after. I know you'll be able to get in. Tell them only if you are questioned, that you can't make the week-end.

J.F. – Please have Spiegel see me as soon as possible. (Come in with Him):
Has S.E.A.'s sentence been reduced to 9 mo. & 17 days to 8 mo. (8 mo. sentence = 8 mo. minus 40 days while 9 mo. 17 day sentence = same minus 1 mo. & 17 days) a flat 8 mo. – If the former he would get out on July 3rd; if latter on Aug. 11th. Of course, if gets Parole 15 days soon enough, he would get out in either case (15 days is Parole.) – What's on Designation for L.K.? Did you get message from N.I.M. on same? — CF – to come on another day but TUES. – LT. WYNNE is on Tues. — Met the "devil". Is combination a Telem. was sent to (Home + address given to N.I.M.) – Bottom Page 2 – memo – 6/16/51 – I specified a P.L. & gen. fac. cond. No Bill unless + until says so. Black said delivery intended, he would install Himself. Please arrange a Sat. at your convenience. – What's the latest on Rex Brown, Army Base at Sumpter, + Telekron. Note that 4/4.95 air conditioning unit advertised for $119 is only ½ HP. + a pre-cool jack. – You can arrange installation + Service for Customer. ASK NORI.

To DEF: Re: Litigation JOB

Board check the enclosed papers.

PHOTOSTAT same on [illegible] retaining photostats

MAIL IMMEDIATELY original to PORT JERVIS,

marked personal, att. NORMAN

Give photostatic copy to SIDNEY LIDZ, only.

If he's gone on vacation or is going on vacation

I want to work on same until he comes back, then

no one is to give same to him. But I would

like time to get it prepared, sufficient time in, in order

this get started.

Ask NORMAN to get Patent work started on this [illegible]

DRUM TYPE COLOR WHEEL FOR BLACK-&-WHITE & COLOR TV

Let us consider a drum covered of 6-slots (2 series of the prim
and let us assume that this drum will be used for a 20" r
as we will assume

$$1.25h = l$$

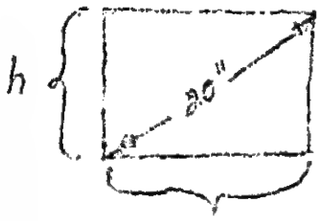


FIG. I

then

$$(1.25h)^2 + h^2 = 20^2$$

$$h^2 = \frac{400}{2.56} = 156.2$$

$$h = 12.5"$$

$$l = 1.25(12.5) = 15.6"$$

would be the dimensions of the tube. For each slot to "cover" the pi
would be necessary that

$$\frac{\frac{12.5}{2}}{\sin\frac{60}{2}} = \frac{6.25}{2} = 12.5" = r$$

of the Drum.

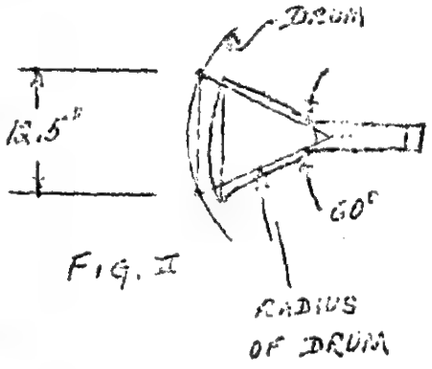


FIG. II

Let us now suppose the drum is formed a
section shown in Fig. 3, in which the slots
curved members "fitting" into a retainer rin
These slots were to consist of 1/16" thk. of wir
sheet, and their length were to be 17", the
each would have a volume of

$$2\pi r l \left[\frac{60}{360}\right] t = \frac{2\pi(12.5)(17)(60)\frac{1}{16}}{360}$$

$$13.9 \text{ in.}^3$$

and a specific gravity of 1.18, then

$$\frac{62.5 \frac{\#}{ft.^3}}{1728 \frac{in.^3}{ft.^3}} \cdot 1.18 \cdot 13.9 in^3 = 0.58$$

FIG. 3

would be the weight of each slot, where:-
62.5 #/ft.³ is taken as the density of w

In the standard CBS color discs, 9 discs (3 series of the primary three) ar
at 1200 rpm. This would set a speed of

$$\frac{9}{6}(1440) = 2160 \text{ rpm for the 6-slot drum}$$

This would mean an angular velocity of

$$\frac{1440 \frac{\text{rev.}}{\text{min.}} \left(2\pi \frac{\text{rad.}}{\text{rev.}}\right)}{60 \frac{\text{sec.}}{\text{min.}}} = 150.8 \frac{\text{rads.}}{\text{sec.}}$$

The centrifugal force acting on each slot would then be:-

$$F_c = \frac{W}{g} w^2 r$$

$$= \frac{0.594 \text{ lb.}}{32 \frac{\text{ft.}}{\text{sec.}^2}} \cdot \left[150.8 \frac{\text{rad.}}{\text{sec}}\right]^2 \frac{12.5 \text{ ins.}}{12 \frac{\text{ins.}}{\text{ft.}}}$$

$$= 440 \#$$

and both retainer rings would therefore be said to acting under a l

$$440 \frac{\#}{\text{slot}} (6 \text{ slots}) = 2640 \#$$

together, and

$$\frac{2640 \#}{2 \text{ retain rings}} = 1320 \frac{\#}{\text{ring}}$$

To hold the tensile stress in each ring to 1/5 of an assumed ult value of 71,000 #/in.^{2} with a 3/4" wide ring would require a

$$\frac{1320 \#}{0.75 \text{ ins.} (\text{t})} = 14{,}000 \frac{\#}{\text{in.}^2}$$

$$\frac{1320 \#}{0.75 \text{ ins.} (14{,}000 \#/\text{in.}^2)} = 0.1258" = t$$

[illegible] slot must [illegible] be reviewed as a uniformly load [illegible] as simply supported at each end:-

$V = wl$

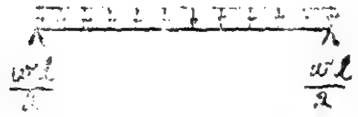


Fig. IV

$$M = \frac{wx}{2}(l - x) = EI\left(\frac{d^2y}{dx^2}\right)$$

$$\frac{w}{2}(lx - x^2) = EI\left(\frac{d^2y}{dx^2}\right)$$

$$\frac{w}{2EI}\left(\frac{lx^2}{2} - \frac{x^3}{3}\right) + C_1 = \frac{dy}{dx}$$

But $\frac{dy}{dx} = 0$, when $x = \frac{l}{2}$, and so:-

$$\frac{w}{2EI}\left(\frac{l^3}{8} - \frac{l^3}{24}\right) + C_1 = 0$$

$$C_1 = -\frac{w}{2EI}\left(\frac{l^3}{12}\right) = -\frac{wl^3}{24EI}$$

[illegible]

$$\frac{dy}{dx} = \frac{w}{2EI}\left(\frac{lx^2}{2} - \frac{x^3}{3}\right) - \frac{wl^3}{24EI}$$

$$y = \frac{w}{2EI}\left(\frac{Lx^3}{6} - \frac{x^4}{12}\right) - \frac{wL^3x}{24EI} + C_2$$

But, since $y = 0$ when $x = 0$, then

$$C_2 = 0$$

and

$$y = \frac{w}{24EI}\left(\frac{Lx^3}{6} - \frac{x^4}{12} - \frac{L^3x}{12}\right)$$

at $x = \frac{L}{2}$, it is clear that (y) would have its maximum value, $(y)_{max.}$ would be given by:-

$$y_{max.} = \frac{w}{24EI}\left(\frac{L^4}{48} - \frac{L^4}{192} - \frac{L^4}{24}\right)$$

$$= -\frac{5wL^4}{384EI} = -\frac{5WL^3}{384EI}$$

This gives us a form for computing the deflection, and the stresses, in the when the ends are up to full fixation speed. It is now necessary to c the value of (I) for the slots.

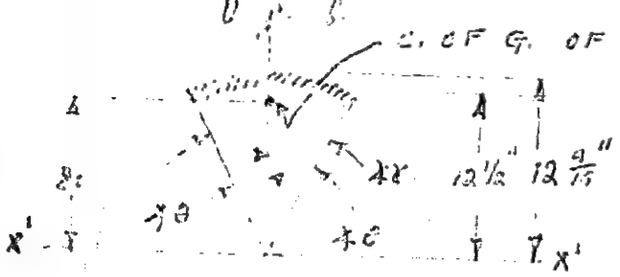


Fig. 8

It is clear that the mean radius r = 12 ½" and r = 12 9/16" (solid r ∴ 12 17/32") would be the radius of gyration of the slot indicated in I with respect to the axis x'x' You have the x-cross-sectional area slot is approximately

$$\frac{\frac{1}{16}(2\pi r_{mean}) + r}{360} =$$

$$\frac{\frac{1}{16}(2\pi)(12\frac{17}{32})(60)}{360} = 0.822$$

(I) with respect to the $x'x'$ would be

$$Ak^2 = 0.822\,(12\tfrac{17}{32})^2 = 129\ in.^4$$

The center of gravity of the slot would be given by:-

$$y_0 = \frac{r_{mean} \sin\theta}{\text{rad. } \theta}$$

$$= \frac{(12\frac{17}{32})(\sin 30^\circ)}{\text{rad. } 30^\circ} = \frac{12\frac{17}{32}"\,(0.5)}{0.5236} = 1$$

If (I_0) is the moment of inertia of the steel section about its own c-of-gravity, then

$$I_{x'x'} = I_0 + A y_{gc}^2$$

and so

$$129 \text{ in.}^4 = I_0 + 0.822(11.95)^2$$

$$129 - 0.822(142.5) = 129 - 117.5 = 11.5 \text{ in.}^4$$

From this, it follows that

$$y_{max.} = -\frac{5Wl^3}{384EI} = -\frac{5(440)(17)^3}{384(2)(10^6)(11.5)} = 0.00122 \text{ ins.}$$

which is acceptable if it does not involve an excessive stress.

$$y_{max} = \frac{5Wl^3}{384EI} =$$

and

$$M_{max} = \frac{wl^2}{8} = \frac{Wl}{8}$$

Therefore

$$y_{max.} = \frac{Wl}{8} \cdot \frac{5l^2}{48EI} = \frac{5Ml^2}{48EI}$$

But

$$M = SZ$$

where

M = Moment induced in the beam — in-lbs.
Z = Sectional modulus of the beam — in.^{3}
S = stress induced in the beam — #/in.^{2}

and

$$\frac{I}{c} = Z$$

where

c = distance of the extreme fibre from the neutral axis of the beam

and hence

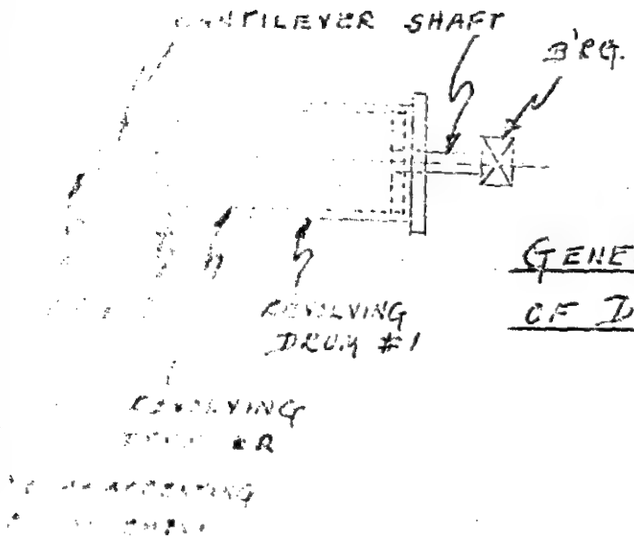
$$y_{max} = \frac{5(S)\left(\frac{I}{c}\right)l^2}{48EI} = \frac{5Sl^2}{48Ec}$$

By this equation,

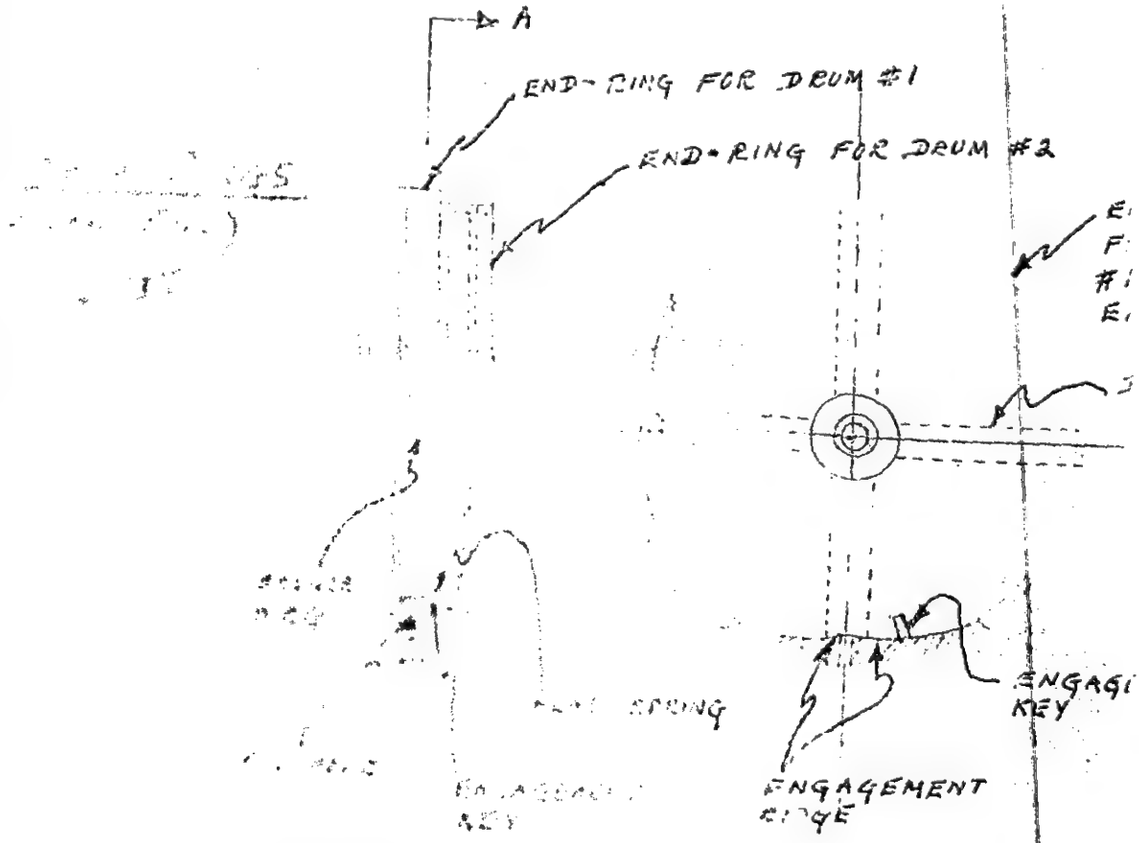
$$0.00122 \text{ ins.} = \frac{5\left(12\frac{12}{32} - 11.5\right)(17^2)S}{48(2)(10^6)} = \frac{5(1.182)(17^2)}{96(10^6)(1.}$$

$$\frac{1.182(0.00122)(96)(10^6)}{5(1.182)(289)} = S = 8.38 \text{ #/in.}^2$$

NOTE:- DRUM #2
CONSIST OF 5 CO
FILTERS, AND 1
LIGHT SLAT; DRU
5 WHITE LIGHT SL
1 COLOR SLAT COM
2 SERIES FOR DR



GENERAL ARRANGEMENT
OF DRUM SUPPORT
FIG. VI



SECTION A-A
FIG. VII

To approximate the combined weights of the Drums, let us proceed as follows:-

12 rivets — 17" lg.,

$$\frac{2\pi r\,60}{360} = \frac{2\pi(12.5)(60)}{360} = 13.1" \text{ wide}$$

and $\frac{1}{16}$" thick

would weigh

$$\frac{12(17)(13.1)(0.0625)(62.5)(1.18)}{1728} = 7.17\#$$

and, if we estimate each end-ring at 3 #, then the di
rings would weigh 12# in total, to give a total weight
approximately 20#. This could be said to have a radius of
gyration of approximately 13", giving the Drum a Σmr^2 of:

$$\Sigma mr^2 = 20\left(\frac{13}{12}\right)^2 = 23.5 \text{ lb-ft.}^2$$

For each Drum to attain a velocity of 150.8 $\frac{\text{rads.}}{\text{sec.}}$,

$$\frac{23.5}{2(32)}(150.8)^2 = 11,700 \text{ ft.-lbs.} = 8,350 \text{ ft.-lbs.}$$

of energy is required in the form of rotational energy. Quite evidently,
[illegible] a large motor, and it would be desirable to reduce this requi
the value of the indicated figure. Let us therefore reduce the weight o
rings, while keeping the weight at the indicated radius of gyration,
a 3# load for the 4-end-rings in total. In fact now,

$$\frac{10.17}{32}(150.8)^2 = \frac{7240}{2} \text{ ft-lbs.} = 3620 \text{ ft.-lbs.}$$

would be required (kinetic energy), and if this were supplied in
a

$$\frac{3620 \text{ ft-lbs.}}{(60 \text{ sec.})\left(\frac{550 \text{ ft-lbs./sec.}}{1 \text{ H.P.}}\right)} = 0.110 \text{ H.P.}$$

motor would be required.

In bringing the Drum down to a stop, let us assume t
60 secs. is stipulated. Then the negative acceleration of

$$\alpha = \frac{\omega}{t} = \frac{2(150.8-0)}{60} = 5.03 \frac{\text{rads.}}{\text{secs.}},$$

is entailed, and the torque-rating of the brake would have to be

$$\frac{10.17}{32}(5.03) = 1.595 \text{ ft.-lbs}$$

Were this to be applied via a mechanical brake, this would mean, applied on a 13" radius, a

$$\frac{15{,}95 \text{ ft-lbs.} \left(12 \frac{\text{ins.}}{\text{ft.}}\right)}{(13 \text{ ins.})} = 14{,}7 \#$$

braking-force. If an eddy-current brake were to be used, it would have to be one in which a

$$\frac{36.20}{60 \text{ (sec.)}} \text{ ft-lbs.} = \frac{60.3}{241.3} \frac{\text{ft-lbs.}}{\text{sec.}}$$

energy consumption is planned. The identical electrical rating of the brake would then have to be:-

$$\frac{60.3}{241.3} \frac{\text{ft.-lbs.}}{\text{sec.}} \left(0.746 \frac{\text{K.watts}}{\text{H.P.}}\right) = 0.0825 \text{ KW}$$

$$550 \frac{\text{ft.-lbs.}}{\text{sec.-H.P.}}$$

but because eddy current brakes are quite inefficient, the actual brake rating would have to be substantially larger. A mechanical brake applied to the output shaft of the driving motor also decreases overall

The question arises of applying the braking force until a minimum speed is attained, and then leaving it to the positive pin to bring the drum to a full-stop. For the combined positive and displacement of the drum from Index #2. Assume the use of a ¼" diameter round pin with a cantilever length of 2". By formulas (for cantilever beams)

$$M = Pl = Sz = S\frac{I}{c}$$

$$f = \frac{Pl^3}{3EI}$$

$$f = \frac{Sl^2}{3Ec}$$

Using this formula, we see that for a stress limit which is taken 75% of the elastic limit, and taking the elastic limit to be 50 #/in.², then for a material for which $E = 26(10^6)$

$$f = \frac{0.75 \left(30{,}000 \frac{\#}{\text{in.}^2}\right)(2 \text{ ins.})^2}{3 \left(26 \times 10^6 \frac{\#}{\text{in.}^2}\right)\left(\frac{\frac{1}{4} \text{ ins.}}{2}\right)} = 0.00924 \text{ ins.}$$

Quite obviously, the pin would be working as a spring storing up energy and so, if $f^{(x)}$ represents the force stored in the spring per inch

deflection, then

$$\text{"(work stored in the spring)} = \int_{y=0}^{y=y} Ky = \frac{K}{2} y^2$$

where y = the limiting deflection of the spring. Thus, if we re-arrange equation

$$f = \frac{Pi^3}{3EI}$$

we find from

$$\frac{3EI}{l^3} = \frac{P}{f} = K = \frac{3\pi E d^4}{l^3}$$

we find that

$$K = \frac{3\pi (26 \times 10^6 \text{ \#/in.}^2)(1/4)^4}{2^3} = 119{,}500 \text{ \#/in.}$$

and by this, the work stored by a deflection of 0.00924" would be

$$\frac{1}{2}(119{,}500 \text{ \#/in})(0.00924)^2 = 5.08 \text{ in-lbs.}$$

$$\frac{5.08 \text{ in-lbs.}}{12 \frac{\text{in.}}{\text{ft.}}} = 0.423 \text{ ft-lbs.}$$

energy. We would limit the velocity of the drum to

$$0.423 = \frac{10.17}{2(32)} \omega^2$$

$$\left[\frac{2(32)(.423)}{10.17}\right]^{1/2} = \omega = [2.75]^{1/2} = 1.66 \text{ rads./sec.}$$

of the positioning pin in cent "Home". This would mean that the le of the cam would be reduce the Drum Assembly speed from 150.8 re [illegible] rev./sec., after which the pin would take care of t the Drum Assembly to a full stop.

Assuming the use of a $\frac{1}{2}$ horsepower motor drive and assum [illegible] before Drum #2 is properly positioned for Hack-and-w [illegible] we now proceed to the design of the second positioning

The velocity of the Drum #2 assembly at the end of the above-mentioned 120° can be arrived at by applying the ratio of the specified motor's to the computed required motor, to the acceleration on which the computa- would have been based. Thus, the computed required motor would raise the speed of the Drum Assembly from zero to 1.57 radians/sec. in 60 secs., or in accordance with

$$\frac{1}{2}\alpha(60^2) = \frac{\pi}{2}$$

$$\alpha = \frac{\pi}{60^2} = 5.63 \text{ rads./sec.}^2$$

Using a 0.125 HP motor in the place of the 0.05 HP computed requirement, we may take

$$\frac{(0.125\ HP)}{(0.05\ HP)}\left[5.63 \text{ rads/sec.}^2\right] = 5.98 \text{ rads./sec.}^2$$

as the acceleration which the specified motor would apply. The 120° of travel constitute a travel of

$$\frac{120}{360}(2\pi) = \frac{2}{3}\pi \text{ radians}$$

The above-given acceleration of 5.98 rads./sec. would be applied to an assembly with a Σmr^2 of 10.7 lb.-ft.^{2}, while in the motor armature alone roughly one-half of this Σmr^2 is involved; so the acceleration of the #2 Drum (assuming the same motor was used) would be

$$2(5.98) = 11.96 \text{ rads./sec.}^2$$

$$s = \frac{1}{2}\alpha t^2$$

$$\frac{2}{3}\pi = \frac{1}{2}(11.96)(t^2)$$

$$t = \left[\frac{4(2\pi)}{3(11.96)}\right]^{1/2} = 0.35^{1/2} = 0.592 \text{ secs}$$

[illegible] mentioned arc; and

$$\omega = \frac{1}{2}(11.96)(0.592) = 3.54 \text{ rads./sec.}$$

[illegible] of the arc of travel. The [illegible] positions Drum [illegible]

of the two functions which the latch serves: - (1) firstly, it serves to stop and position Drum #2 with respect to Drum #1 when black-and-white viewing is intended; and (2) it is the means by Drum #1 is motivated along with Drum #2 in color-viewing. In stopping Drum #2 after ~~it has~~ Drum #1 has already been positioned, it must absorb the flywheel energy of Drum #2. This would mean, since Σmr^2 for each Drum has been taken at 5.085 lb.-ft.^{2}, that

$$\frac{(5.085 \text{ lb.-ft.}^2)}{(2)\left(32 \frac{\text{ft.}}{\text{sec.}^2}\right)} (3.54 \text{ rads./sec.}) = 0.382 \text{ ft-lbs.}$$

of energy would have to be absorbed. By reference to the previous calculations concerning the pin which positions Drum #1, it is clear that a member with a sectional modulus equal to a 1/4" ø round would more than suffice for this service, if it were no longer than the aforementioned pin. According to the second criterion for the design of the latch member, it would be required at a maximum to transmit a torque equal to

$$\frac{(10.17 \text{ lb.-ft.}^2)}{(32 \text{ ft./sec.}^2)} [5.16 \text{ rads./sec.}] = 1.671 \text{ ft-lbs.}$$

or

$$(1.671 \text{ ft-lb.})\left(12 \frac{\text{in.}}{\text{ft.}}\right) = 20.05 \text{ in-lbs.}$$

~~at a design stress limit of~~ Since the latch is located on about a 13" radius from the axis of rotation, the torque indicated above implies a load of

$$\frac{20.05 \text{ in-lbs.}}{13 \text{ in.}} = 1.724 \text{ lbs.}$$

applied to the end of the latch. With the latch 2" lg., this would mean the inducing of a bending load of

$$1.724 (2.) = 3.456 \text{ in-lbs.}$$

which is, in fact, insignificant, and worthy of no further computations.

The thing as to the matter of the shafting by which the Drums are motivated. On reconsideration of the loads involved, it is practical, from a superficial observation, to think in terms of a cantilever shafting mounting of the Drums from one end as per the figure below:-

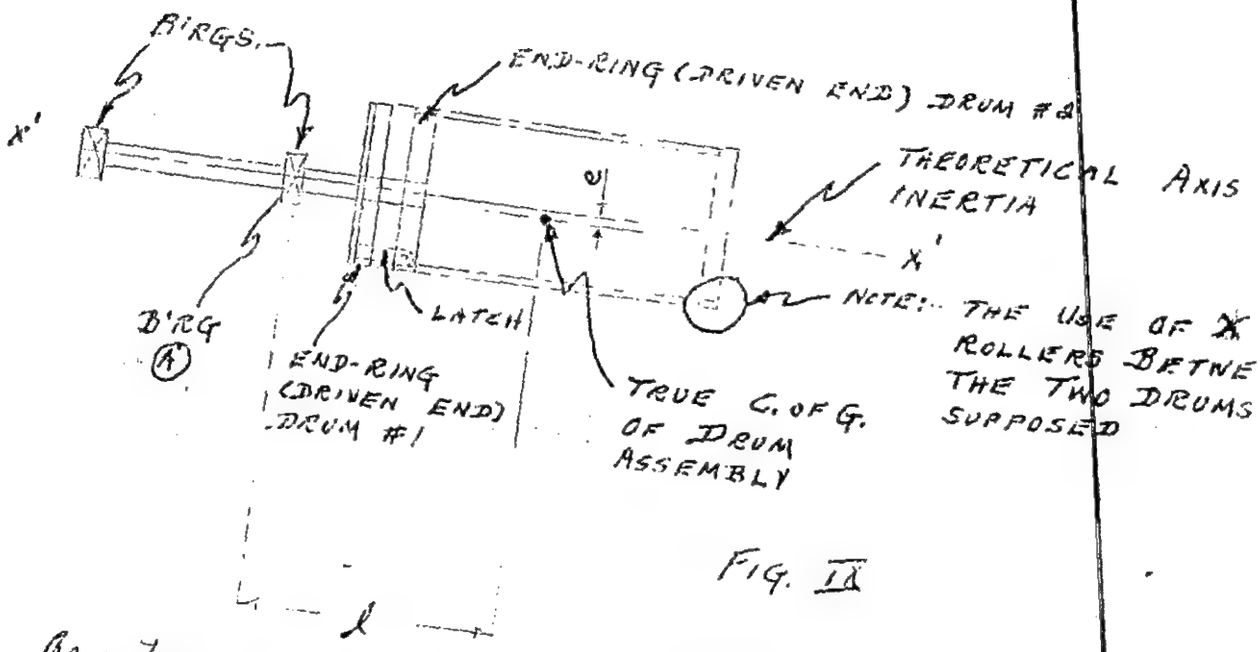


FIG. II

As portrayed above, the double-drum assembly is considered as a single concentrated load on a cantilever shaft, with the length of the shaft being taken as equal to the horizontal span between Brg. (A) and the True Center of Gravity of the combined drum assembly. The use of spacer-rollers as indicated contributes towards the validity of this viewpoint

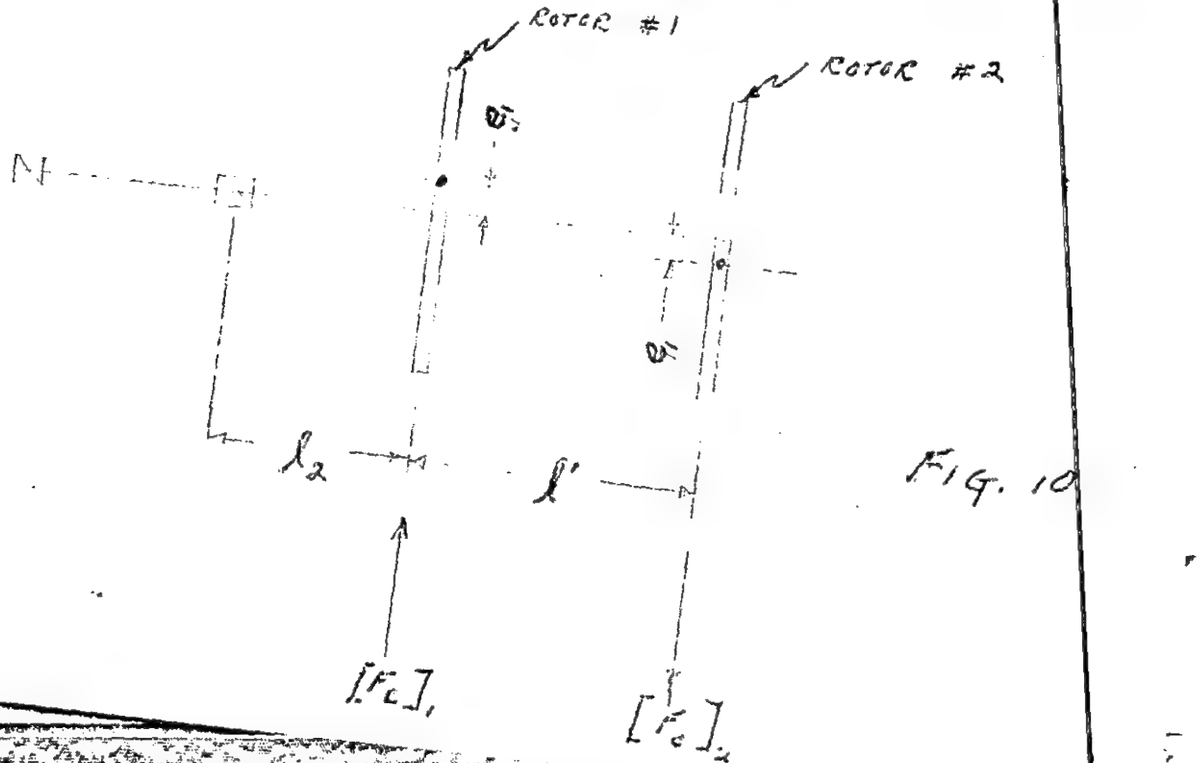
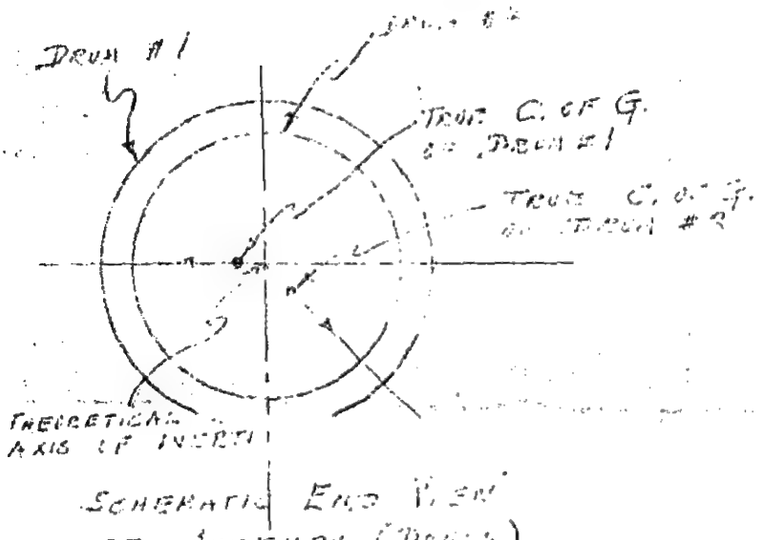


FIG. 10



SCHEMATIC END VIEW OF ASSEMBLY (DRUMS)

FIG. XI

The simple balancing machine, fundamentally a simplified and abridged one, [illegible] in addition to the vibrometer [illegible] shaft to carry the static concentrated loads. In using the shaft for carrying two [illegible] concentric rotors, [illegible] one is required to assume that each rotor has been fabricated to identical tolerances as to balance). The possibilities are illustrated in Figs. 10 [illegible]

a) [illegible] rotors in which a system of identical weight [illegible] identically-oppositely located relative to the axial plane of symmetry are mounted on the same shaft;

and,

b) Fig. 12 illustrates the situation where two rotors of identical weight have four identical correctional weights acting in different axial planes.

Analyzing the situation provided by Fig. 12, it is observed that since the eccentricities of the rotors are identical, each mated [illegible] weight on the shaft, as given by:-

$$W_1 \cdot e_1$$

But $e_1 = e_2$ and $W_1 = W_2$ [illegible] are equal and [illegible] alternately opposite in direction, [illegible] (for balanced couple) [illegible]

$$\frac{W}{2} \cdot e \cdot l$$

For as long as the rotational couple [illegible] the [illegible] of the couple is [illegible] the lift of $(R_2 + R'_2)$ to an [illegible] rotation, and any motion to the right of $(R_1 + R'_1)$ to a downward rotation. Such skewing of the rotational [illegible] of the span would present [illegible] different reactions to the couple, and would consequently result in

[illegible] the neutral axis of inertia of different [illegible]
[illegible] $= x_2 - l'$, [illegible] magnitude would
[illegible] (F_{c_1}) or (F_{c_2}), [illegible] would be destroy
[illegible] shown pictorially below:

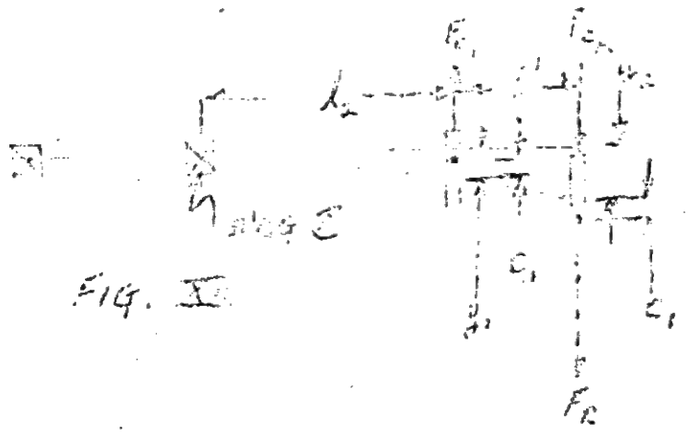


FIG. II

[illegible] a solution in which the forces (F_{c_1}) and (F_{c_2}) [illegible]
[illegible] according to

$$\frac{(F_{c_2})(l'+l_2) - (F_{c_1})l_2}{(l_2+l')} = F_R$$

[illegible] load (F_R) acting at a distance of $(l_2+l'$
[illegible] moment acting on any section of the beam [illegible]

$$[illegible] = EI \frac{d^2y}{dx^2}$$

[illegible] integration, would take the form

$$y = -\frac{F_R}{EI}\left(\frac{[l_2+l']x^2}{2} - \frac{x^3}{6}\right)$$

[illegible] a K-value

$$K = \left[\frac{EI}{\left(\frac{l_2+l'}{2}\right)^2 - \frac{x^3}{6}}\right]$$

[illegible]

and

$$F_{c_2} = \frac{W}{g}(y_{g_2} + e_1)\omega^2$$

Moreover, since

$$F_{c_2} + F_{c_1} = K y_{g_2}$$

we may write

$$\frac{W}{g}(y_1 - e_1)\omega^2 + \frac{W}{g}(e_1 + y_1)\omega^2 = K y_{g_2}$$

which reduces to

$$\omega^2(y_1 + y_2) = \frac{K}{W} y_2 g$$

$$\frac{\omega^2 e_1}{\frac{K_g}{W} - \omega^2} = y_{g_2} = \frac{e_1}{\frac{\left(\frac{K_g}{W}\right)}{\omega^2} - 1}$$

From this relation of the panel system we see:

i) as (ω^2) approaches $\left(\frac{K_g}{W}\right)$ in value, (y_{g_2}) would attain extremely large values, however, exists when $\omega^2 = \frac{K_g}{W}$ (i.e. the resonant condition).

ii) since (y_{g_2}) is proportional to (y_1) with $\left[\frac{K_g}{W\omega^2} - 1\right]^{-1}$ as a multiplier of (y_1), it is also true that when $\omega^2 < \left(\frac{K_g}{W}\right)$ approaches the unit in magnitude, the vibration of the first [illegible] Rotor #1 is the critical section, while, [illegible] becomes

$$y_1 = \frac{y_2}{1 - \frac{K_g}{W\omega^2}}$$

[illegible] Rotor #2.

[illegible] two [illegible] coupling [illegible] two rotors [illegible] unbalanced load [illegible] the two [illegible] the [illegible] vibrating [illegible] the [illegible] the [illegible]

$$\bar{x} = \frac{2}{3}AC - B^2 - \frac{1}{3}A^2 = 0 - 0 + \frac{0.43}{3} = 0.143$$

$$\bar{z} = \frac{1}{4}\left[b + (b^2 + h^2)^{1/2}\right]\bar{x} + \frac{1}{4}\left[h - (h^2 + b^2)^{1/2}\right] =$$

$$\frac{1}{4}\left[0.43 - (.0081 + 0.1849)^{1/2}\right] + \frac{1}{4}\left[0.04 + (0.0016 - 0.0729)^{1/2}\right] =$$

$$\frac{1}{4}\left[0.43 + 0.43\right] + \frac{1}{4}\left[0.04 + 0.16\right] =$$

$$0.102 + 0.079 = 0.176$$

$$x = \bar{x} + x_0 = 0 + 0.176 = 0.176$$

$$y = \bar{y} + y_0 = 0 + 0.176 = 0.176$$

$$W = 4x^2 + 3k - 12gl = 4(0.176)^2 + 3(0.143) - 12(0) =$$

$$= 4(0.031) + 0.429 = 0.124 + 0.429 = 0.553$$

Now, we have to evaluate I:-

$$I_1 = -A + x^{1/2} + (y^2 + x^2)^{1/2}$$

$$I_2 = -A - x^{1/2} + (y^2 + x^2)^{1/2}$$

$$I_3 = -A + x^{1/2} - (y^2 + x^2)^{1/2}$$

$$I_4 = -A - x^{1/2} - (y^2 + x^2)^{1/2}$$

Now,

$$I_1 = -0 + 0.176^{1/2} + (0.176 + 0.553^{1/2})^{1/2} = 0.42 + (0.176 + 0.$$

$$= 1.0000 - 0.42 + 1.446 = 1.286''$$

[illegible] in the scale of

[illegible] = Original value [illegible]

$$A^2 - 0.86A - 0.1846 = 0$$

[illegible]

$$A = 0.43 \pm (0.1849 + 0.1846)^{1/2} = 0$$

$$A = 0.43 - 0.4305 = 0.0005 \approx 0$$

Now, the above value is correct. Taking (A) as follows

$$A = \frac{1}{4}\left[b + (b^2 + h^2)^{1/2}\right] + \frac{1}{4}\left[h - (h^2 + b^2)^{1/2}\right] =$$

$$\frac{1}{4}\left[0.43 + 0.43 + \frac{1}{4}\left[0.04 - (0.0016 + 0.1849)^{1/2}\right]\right] =$$

$$= \pm \left[0.30^4 - \frac{1}{2}(0.12^4) \right] = \left[0.004 - 0.062 \right]^{1/2} =$$

$$\pm \left[0.42 \right] = 0.471$$

$$x = 0.471$$
$$y = 0.471$$
$$z = +(0.471)^2 + 0.43 = +(0.005) + 0.43 =$$
$$0.09 + 0.43 = 0.52''$$

$$x_1 = 0.471^{1/2} + (0.471 + 0.52^{1/2})^{1/2} = 0.276 + (0.471 + 0.$$
$$= 0.276 + 0.71^{1/2} = 0.276 + 0.86 = 1.136''$$

Coordinates

$$x^4 - 0.6x - 0.43 = 0$$
$$1.66 - 0.6(1.136) - 0.43 = 0$$
$$1.66 - 0.708 - 0.43 \neq 0$$

Signs, coordinates

$$x = \frac{1}{2}\left[h + (h^2 + k^3)^{1/3} \right] + \frac{1}{2}\left[h - (h^2 + k^3)^{1/3} \right] =$$
$$\frac{1}{2}\left[0.20^4 \right] + \frac{1}{2}\left[-0.12^4 \right] = 0.102 - 0.062 = 0.04$$

$$x = 0.04$$
$$y = 0.04$$
$$z = +(0.04)^2 + 0.43 = +(0.0016) + 0.43 =$$
$$0.0056 + 0.43 = 0.4356$$
$$x_1 = 0.4^{1/2} + (0.4 + 0.1056^{1/2})^{1/2} =$$
$$0.2 + (0.04 + 0.3)^{1/2} = 0.2 + 0.7^{1/2} =$$
$$0.2 + 0.835'' = 1.035''$$

Coordinates

$$x^4 - 0.6x - 0.43 = 0$$
$$1.11 - 0.6(1.035) - 0.43 = 0$$
$$1.11 - 0.621 - 0.43 \neq 0$$

[illegible]

This previously found was based on considering the diagram at ... [illegible] ... "shock-torque" to be 1.5 times the steady value, according to ... of "Shigley from a Dynamic Viewpoint",

$$d = \left[\frac{16}{\pi}\right]^{1/3} = 2.0 \left[\frac{(22.5)(1.5)}{\pi}\right]^{1/3} =$$

$$2.237 \left[\frac{33.75}{12}\right]^{1/3} = 2.237(1.15) = 2.521"$$

shaft would be required to yield not more than a 1%/20 ... [illegible] ... Shigley, ... [illegible] ... of "Shigley from a Dynamic Viewpoint",

$$\frac{16 M_t}{\pi d^3} = S_s$$

If again we use M_t = [illegible] "shock torque" and $d = 1.125"$ (as previously computed)

$$\frac{16(1.5)(22.5)}{\pi (1.125)^3} = \frac{24(22.5)}{\pi (1.42)} = 121 \text{ #/in.}^2$$

would be the shear stress due to torsion. The combined shear due to torsion and bending would then be:—

$$\left[15000^2 + 121^2\right]^{1/2} = \left[2.25(10^8) + 14.7(10^4)\right]^{1/2} =$$

$$15000 \text{ #/in.}^2$$

and hence, a 1⅛" [illegible] ... multiple the principle ... [illegible] ... value of resonance speed ... [illegible] ... by $\left[\frac{K_2}{K_1}\right]^{1/2}$ acco... [illegible] ... Shigley from a Dynamic Viewpoint", Since

$$K = \frac{3EI}{l^3} = \frac{3(30 \times 10^6)(\pi)(1.125)^4}{64(12)^3} =$$

$$\frac{3(30^6)(\pi)(1.5)}{64(1728)} = 2.21 \times 10^6$$

Now,

$$\left[\frac{K_2}{K_1}\right]^{1/2} = \left[\frac{2.21 \times 10^6}{2.25 \times 10^6}\right]^{1/2} = \left[.9350\right]^{1/2} = .914$$

per

$$y = \frac{\frac{2}{3}}{\frac{\omega^2}{\omega_n^2} - 1}$$

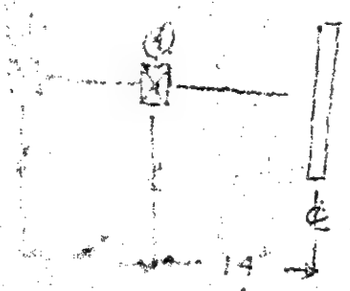
... Eq. (10) ... "Mechanical Vibrations" ...

$$y = \frac{\frac{2}{3}}{\frac{\omega^2}{\omega_n^2} - 1} = \frac{\frac{2}{3}}{2^2 - 1} = \frac{2}{3 \cdot 3}$$

... $e = 0.1$", ...

$$y = \frac{2 \cdot 1}{3 \cdot 3} = 1.0137"$$

... to be the center of the bearings ... bearing spacing: - assume ... (center to center) between ... bearings:



... computed shaft requirement, ... 15,000 psi, was 1.035". ... shaft ... a shaft would withstand ... would be: -

$$M = SZ = S\pi d^3/32 =$$

$$\frac{(15,000)(\pi)(1.035)^3}{32} = \frac{15000(\pi)(1.12)}{32} =$$

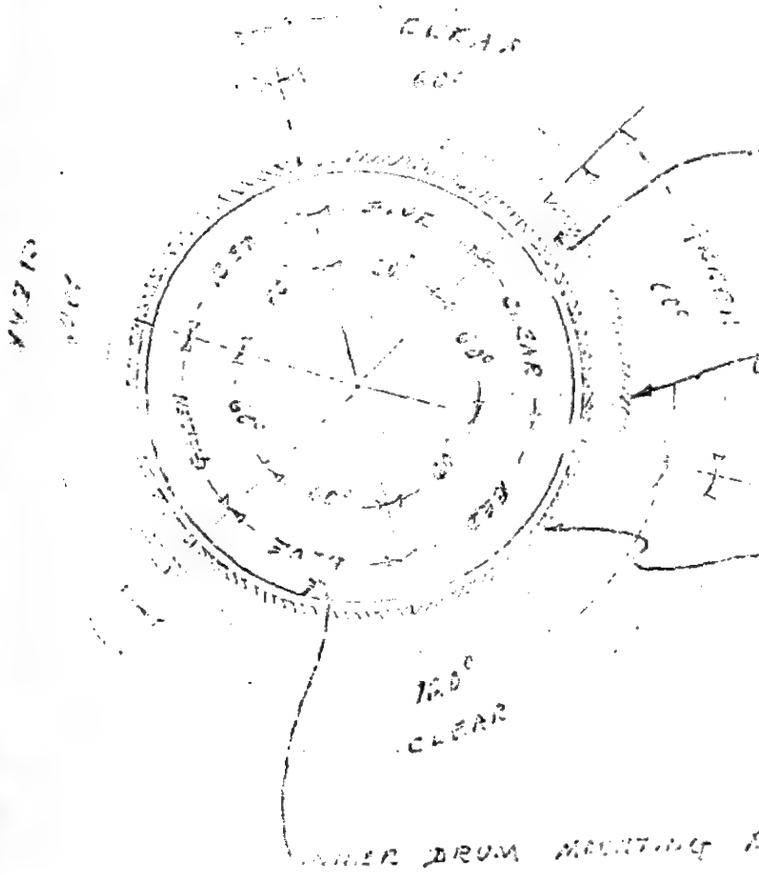
1650 in-lbs.

... = ... on Eq. (B)

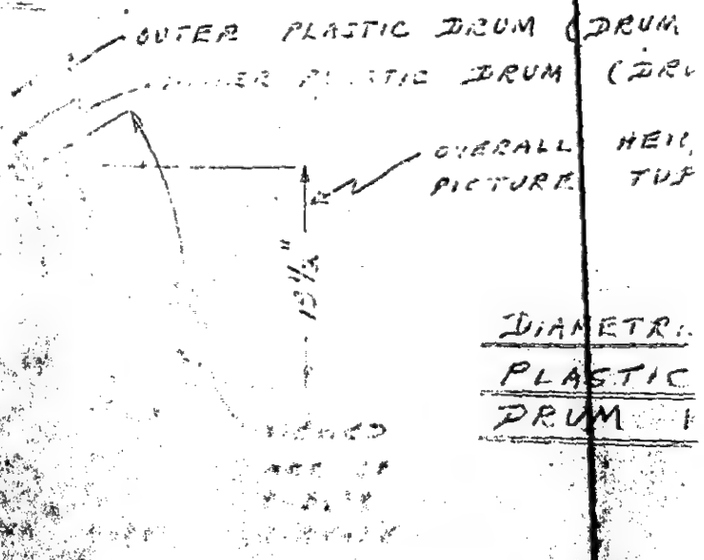
... 530 π = ... on Eq. (A)

... ground ... would be ... rotations.

[illegible] 20" TUBE

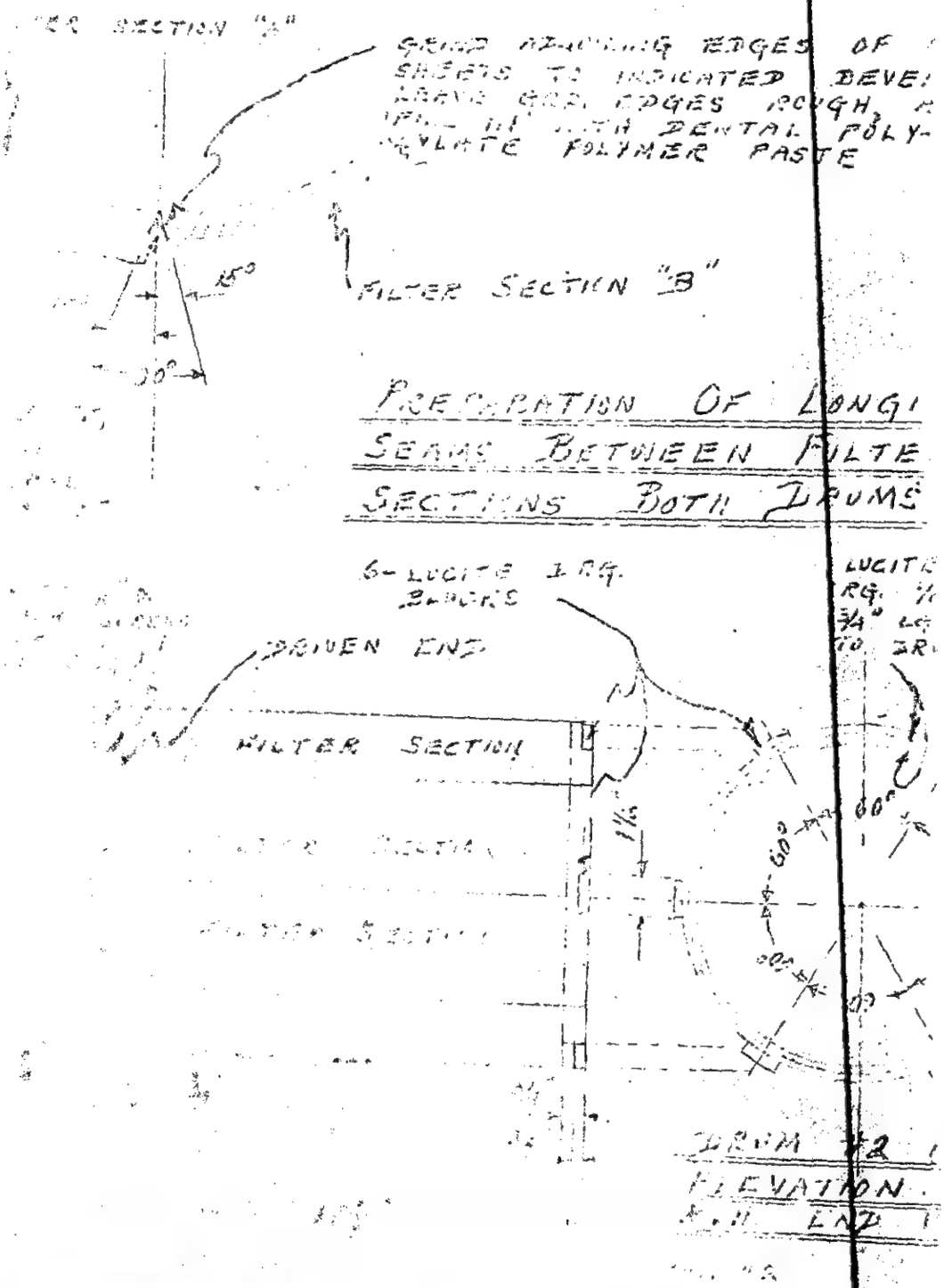


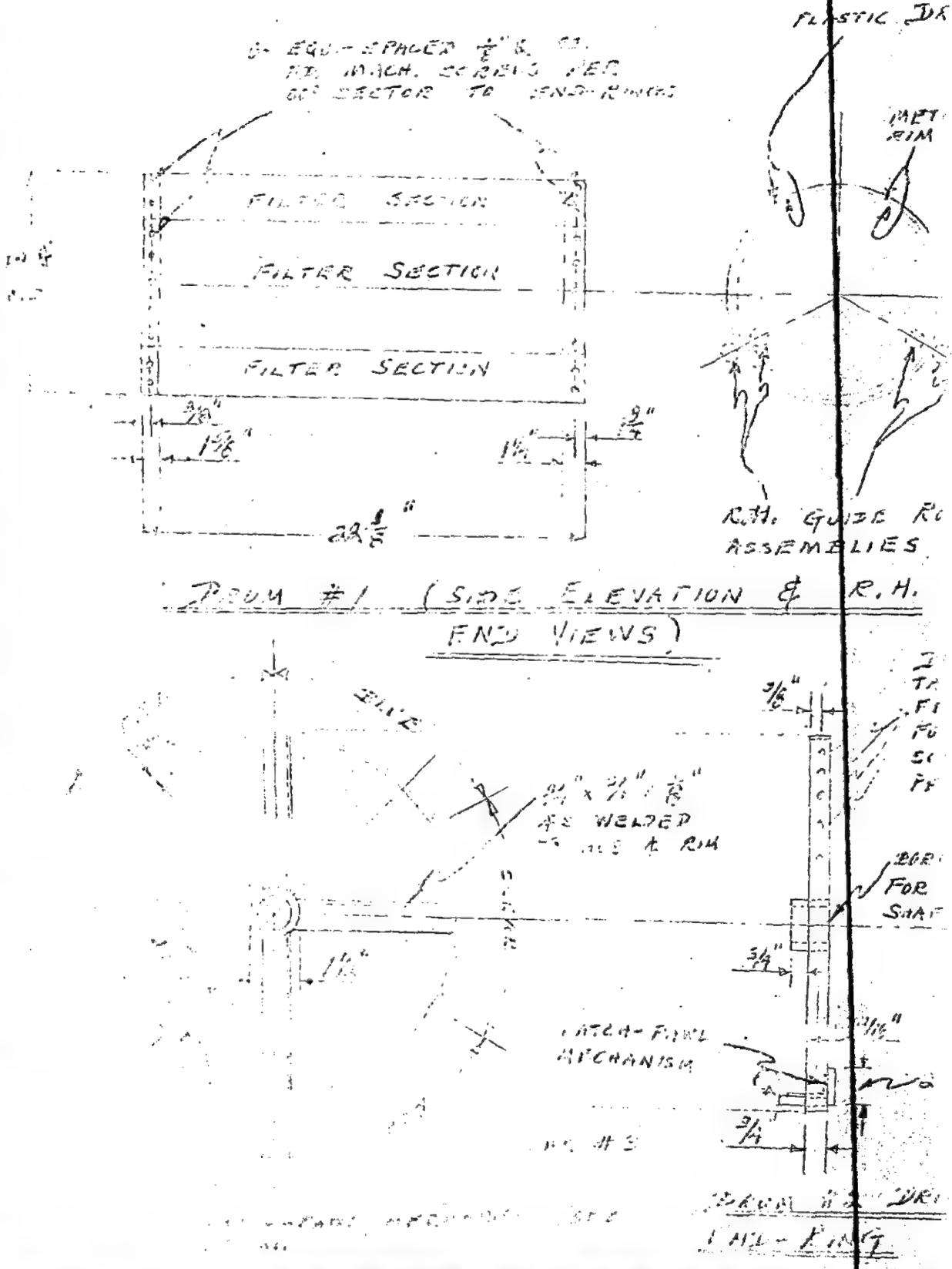
[illegible] SHOWING ARRANGEMENT
[illegible] SECTORS ON DOUBLE-
[illegible] ASSEMBLY



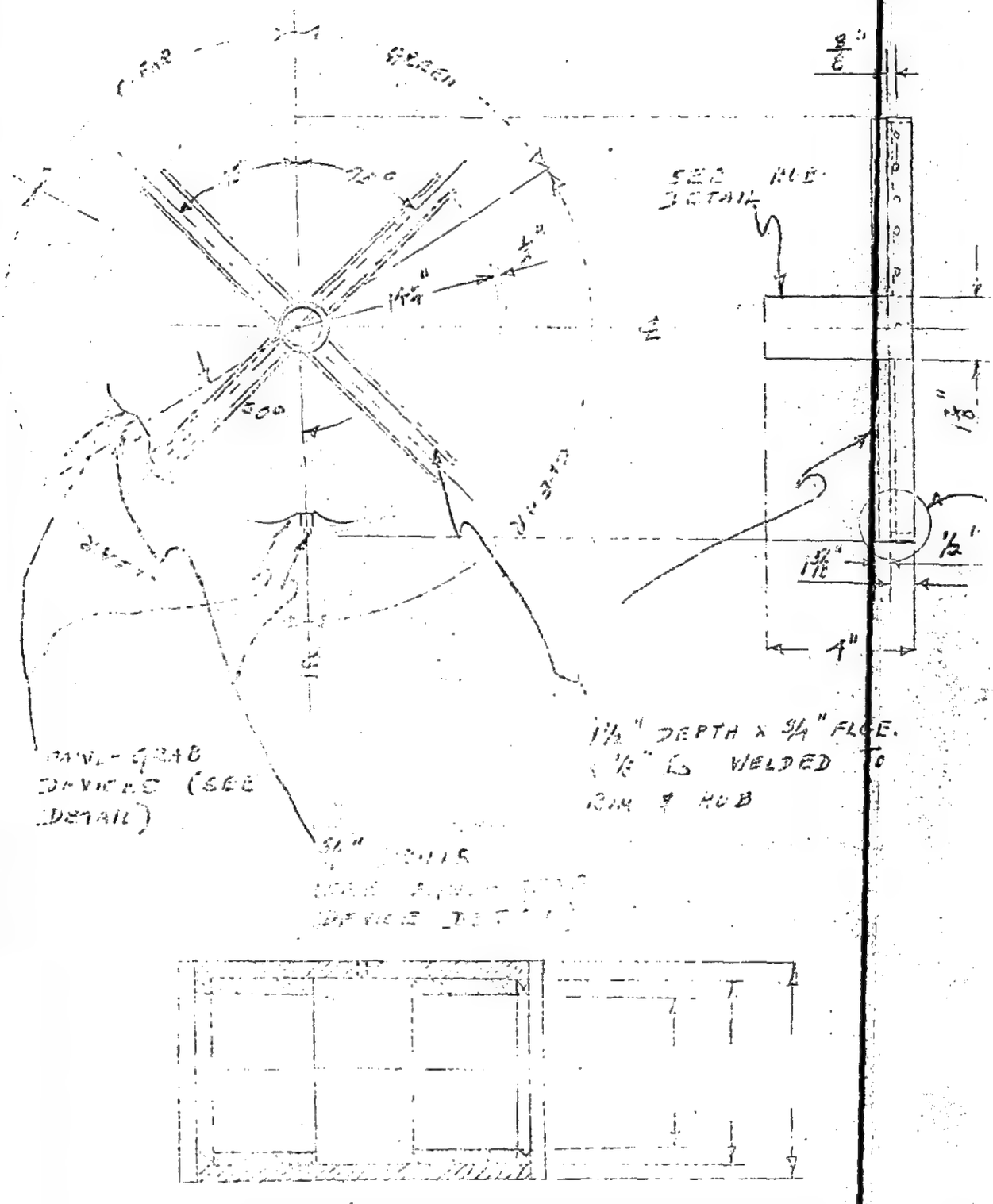
DIAMETR
PLASTIC
DRUM

SET #


ER SECTION "A"
GRIND ROUNDING EDGES OF
SHEETS TO INDICATED DEVE
LEAVE SQUARE EDGES ROUGH
FILL WITH DENTAL POLY-
VINYLATE POLYMER PASTE
45°
30°
FILTER SECTION "B"
PREPARATION OF LONGI
SEAMS BETWEEN FILTE
SECTIONS BOTH DRUMS
6-LUCITE SQ.
BARS
DRIVEN END
FILTER SECTION
60°
60°
DRUM #2
ELEVATION
END



DRUM #1 (SIDE ELEVATION & R.H. END VIEWS)


SEE HUB DETAIL
4"
1 3/16" DEPTH x 3/4" FLGE.
1/2" ID WELDED TO RIM & HUB

FD-141
(1-13-48)

BULKY EXHIBIT

Date received 7/9/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Ultimate disposition to be made of exhibit Retained
Estimated date of disposition-To be decided at conclusion of case.

List of contents:

128. Two photostatic copies of thesis dated 7/6/51 together with two photostatic copies of drawing entitled "Switching Circuit for Double-drum Arrangement".

74

100-95068-1B

INDEXED

Certified Copies:-

Note (1) Insert (4)

screen.]

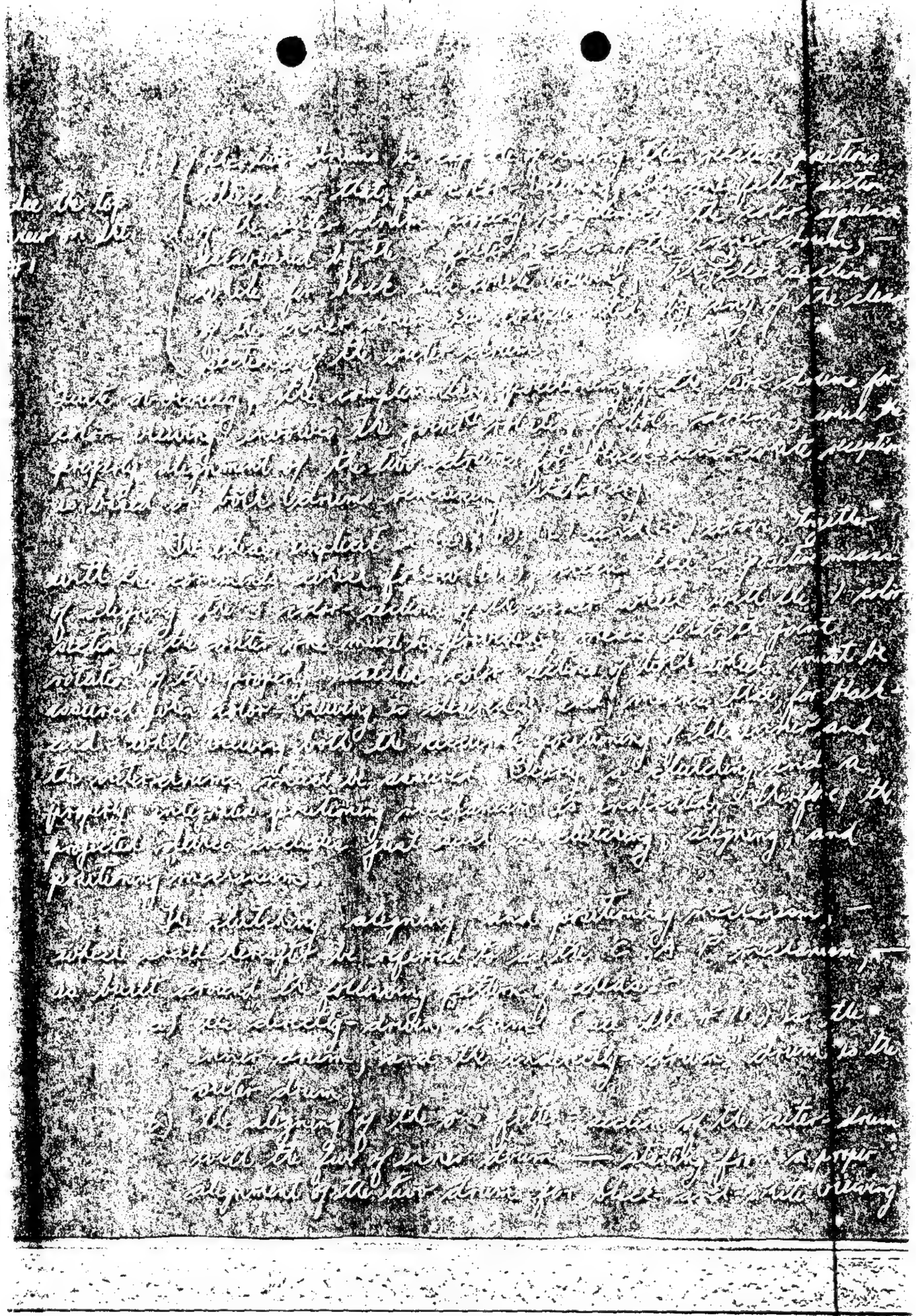
(c) illustrates between the C.R. It will be suitable for the color- distance provide supporting and it is length of the distributed screen.

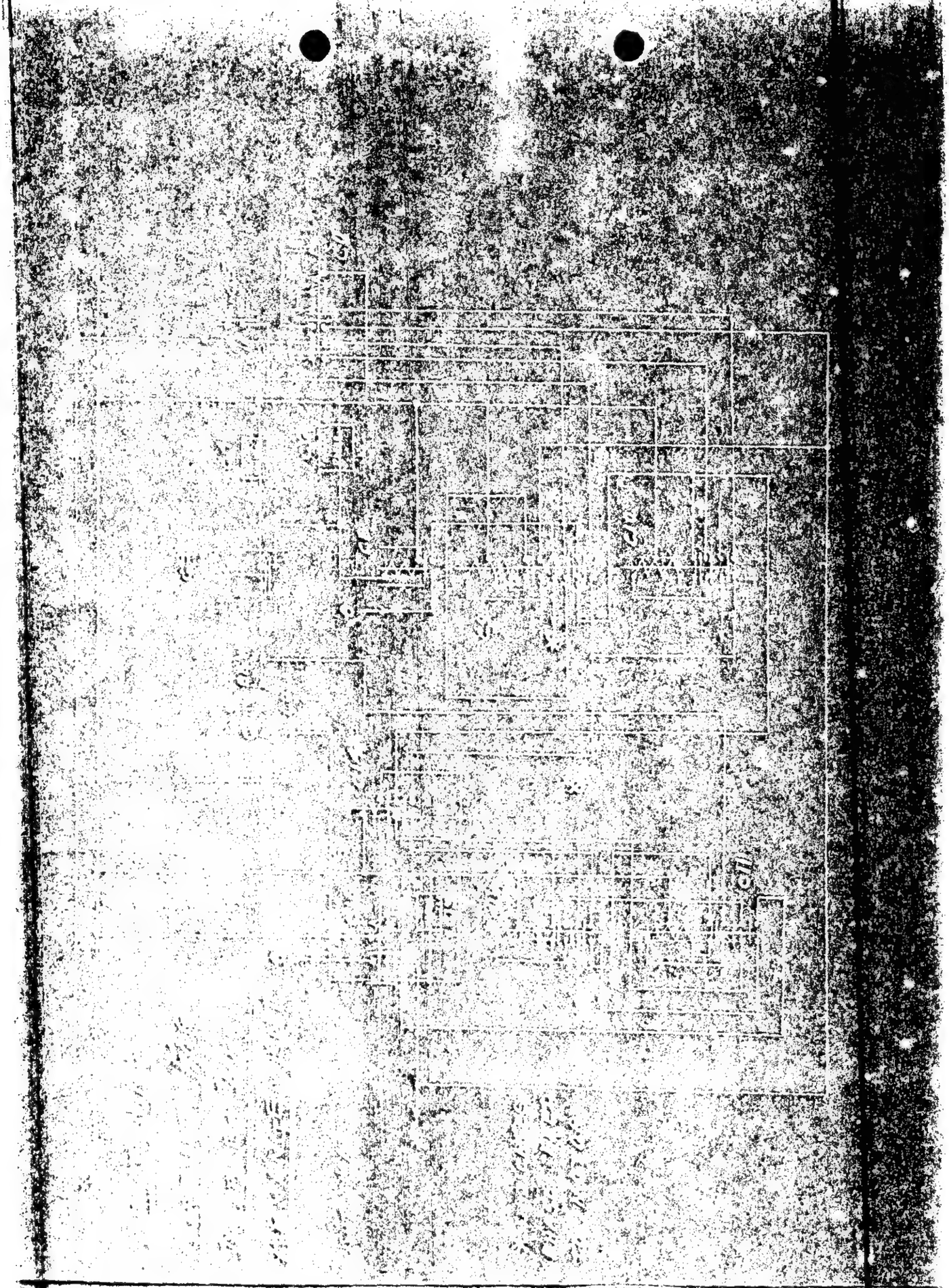
color- the drum fundamental accomo- the same C.R. two symmetric between the stroke is double drum color wearing on the

impressed the same on.

F equal- portion,

the color- filter-





Carbon Copies:-

Sheets (1) Item (4)

And to substitute sheets replacing the marked
(revised) sheets of the said plan. Art. (17)
In the New Forest Inclosure Act 1877 and Regulations
made thereunder. Still Exploration Folio Map.

OBJECTIVE

FUNDAMENTAL PRINCIPLES OF THE PROJECTED DESIGN

(1) { the two drums be capable of having the relative positions altered so that, for color-viewing the one filter-section of the outer drum properly complements the color-sequence established by the filter-sections of the inner drum, — while for black and white viewing the filter-section of the outer drum is complemented by any of the clear portions of the inner drum;

and (2) the complementary positioning of the two drums for color-viewing leaves the front filter of each drum, while the proper complementing of the two drums for black and white reception leaves no filter at all.

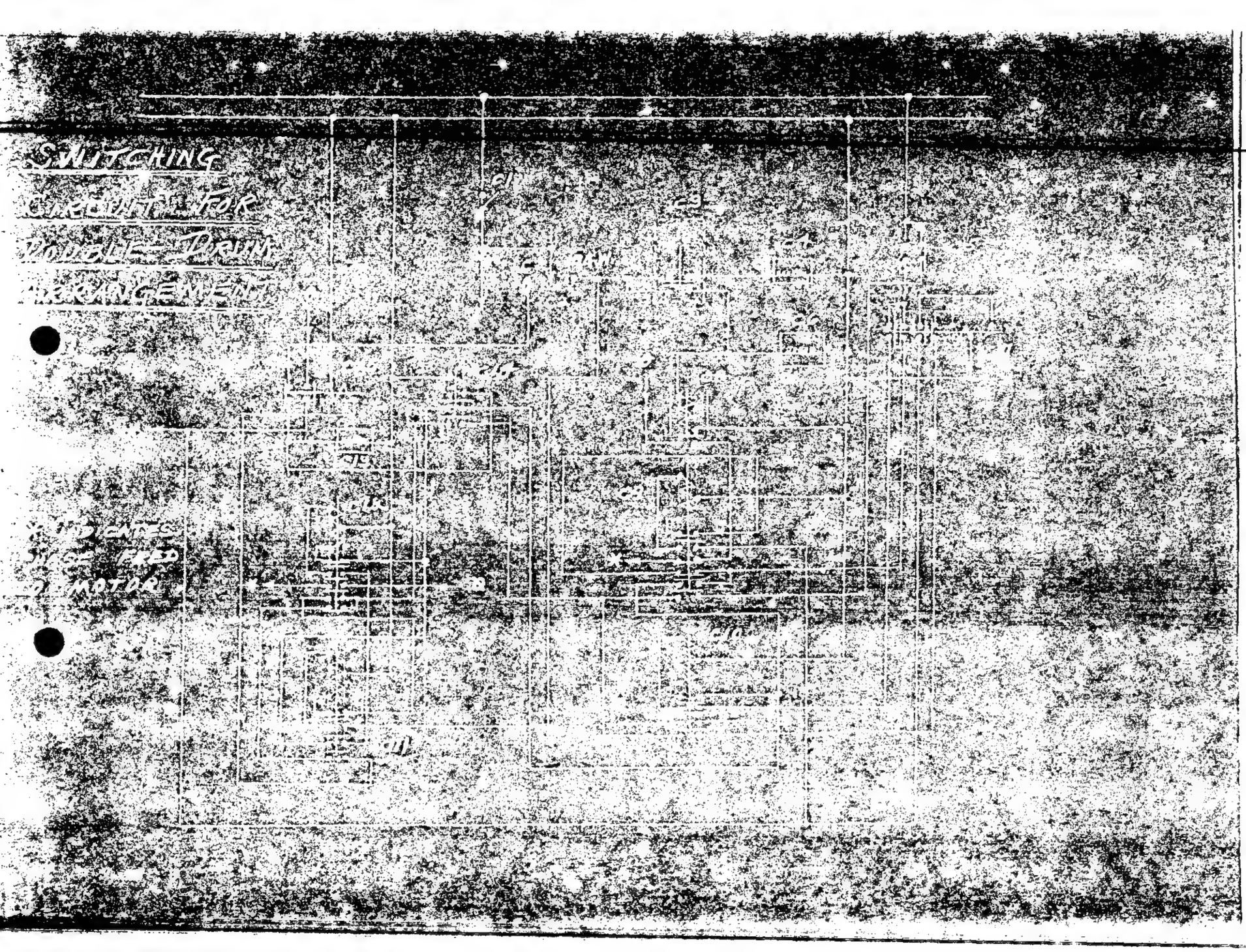
In the above-described [illegible] (1), (2), and (3) above, together with [illegible] color-filter (1), [illegible] positive means [illegible] the color-sectors of the [illegible] the point [illegible] suitable color-filter [illegible] for black-[illegible] filter, and [illegible] of the [illegible] and a [illegible] the [illegible] and [illegible]

[illegible]-loaded

[illegible] provides (see Illus. [14], [15], [5], [7], and [4]) that the latch-pawl (Illus. [5] and [15]) locked in located in the grab (Illus. [7] and [15]) shown as 60° off the vertical centerline on Illus. [4] be ejected from the grab-slot by the action of the solenoid-actuated plunger (Illus. [15]), that the just-released latch-pawl and the [illegible] drum of which it is a member be rotated thru a 300° arc of travel while the outer drum is held stationary by the continuously-energized solenoid's plunger, and that the latch-pawl member of the outer drum then be engaged in the grab-slot of the grab shown on the vertical centerline of Illus. [4].

(To be continued)

SWITCHING
CIRCUIT FOR
DOUBLE-DRUM
ARRANGEMENT



FD-141
(7-1-48)

BULKY EXHIBIT

Date received 9/27/51

ABRAHAM BROTHMAN
100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained USA-SDNY

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

127. Photostatic copy of decision of Circuit Court of Appeals in case entitled US v BROTHMAN & MOSKOWITZ.

75
100-95068-1B

UNITED STATES COURT OF APPEALS

FOR THE SECOND CIRCUIT

No. 290—October Term, 1950.

(Argued June 14, 1951. Decided July 26, 1951.)

Docket No. 22039

UNITED STATES OF AMERICA,

Appellee,

—v.—

ABRAHAM BROTHMAN and MIRIAM MOSKOWITZ,

Appellants.

Before:

SWAN, *Chief Judge*, AUGUSTUS N. HAND and L. HAND, *Circuit Judges*.

Appeal from the United States District Court for the Southern District of New York.

From judgments of conviction and sentence after trial upon an indictment charging both defendants with conspiracy to obstruct justice and defendant Brothman alone with the substantive offense, the defendants have appealed. Affirmed on conspiracy count, reversed on substantive count.

1729

JOHN MCKIM MINTON, *Attorney for appellant Brothman*, William P. McNulty, of counsel.

WILLIAM L. MESSING, *Attorney for appellant Moskowitz.*

IRVING H. SAYPOL, United States Attorney, *for appellee*; Bruno Schachner, Roy M. Cohn, John M. Foley and Stanley D. Robinson, Assistant United States Attorneys, of counsel.

SWAN, *Chief Judge*:

These are appeals from judgments of conviction and sentence upon an indictment which charged both appellants with the crime of conspiracy, 18 U. S. C. §88 (1946 ed.), and Brothman alone with the substantive offense of endeavoring to persuade a witness to give false testimony before a federal grand jury, 18 U. S. C. §241 (1946 ed.). Brothman was sentenced to consecutive terms of 2 and 5 years and fines of $10,000 and $5,000 on the respective counts. Moskowitz was sentenced to 2 years imprisonment and fined $10,000. Brothman's appeal raises a single issue, namely, failure to prove venue of the substantive offense. The appeal of Moskowitz challenges the sufficiency of the evidence to prove her participation in the conspiracy, and asserts prejudicial error in the prosecution's summation.

We address ourselves first to the conspiracy count. In the summer of 1947 a federal grand jury in and for the southern district of New York was conducting an investigation of possible violations of the espionage laws. Brothman and one Gold were summoned to appear as witnesses before this grand jury. The conspiracy count charged that both

appellants together with Gold, who was named as a conspirator but not as a defendant, agreed that Brothman should give false testimony before the grand jury, should inform Gold thereof, and Gold should likewise give false testimony consonant with Brothman's. The case against the appellants was made largely by the testimony of Gold. Moskowitz does not question the sufficiency of the evidence to prove that such a conspiracy existed between Brothman and Gold, but contends that she was not shown to have been a party to it. An examination of the record convinces us beyond doubt that the contention is groundless. Without discussing the evidence in detail, it will suffice to refer to a few incidents which indicate that she repeatedly assisted in spinning the false stories of the two main actors. After Gold had been interviewed by agents of the Federal Bureau of Investigation, he recounted in the presence of Brothman and Moskowitz what he had told the agents, and Brothman remarked that he had made "a very intelligent story." The inference that the story was false must have been obvious to Moskowitz. She was also present when Gold refused to tell Brothman about his espionage activities because Brothman "was already deeply enough involved." When Brothman was considering testifying before the grand jury to a story different from that he had originally told the F. B. I. agents, Moskowitz expressed concern and told Gold she was going to tell Brothman to stick to the original story, and she later told Gold that the latter's attorney, Needleman, persuaded Brothman to do so. Finally, on the night before Gold was to testify, Moskowitz told him that she wished to go home early "so that Abe Brothman and I would have plenty of time to match our stories before my appearance before the grand jury the next morning."

The next contention of appellant Moskowitz is that she was prejudiced by repeated statements in the prosecutor's

summation that the defense had failed to contradict the government's testimony. It is conceded that as a general rule a reference to the testimony for the prosecution as uncontradicted is not an indirect comment on the defendant's failure to testify, but the appellant contends that an exception exists where the only persons who could contradict the testimony are the defendants themselves.[1] Assuming *arguendo* that such an exception should be recognized, we do not think that the appellant's case falls within it. The prosecutor's comments were general and made without express reference to Moskowitz. It is possible to explain them as covering occurrences as to which contradiction could have come from others than this appellant. For example, the comment to which objection was first interposed was the following: "The truth of the testimony offered here by Miss Bentley, Gold and others is conclusively established by the failure of the defense to produce one solitary word contradicting any of this testimony." In overruling the objection the court stated, "I will deal with that later properly myself." And in his charge the judge instructed the jury that they may not "infer guilt nor even draw a single unfavorable inference against the defendants because they did not take the stand." We think this was all that was required.[2]

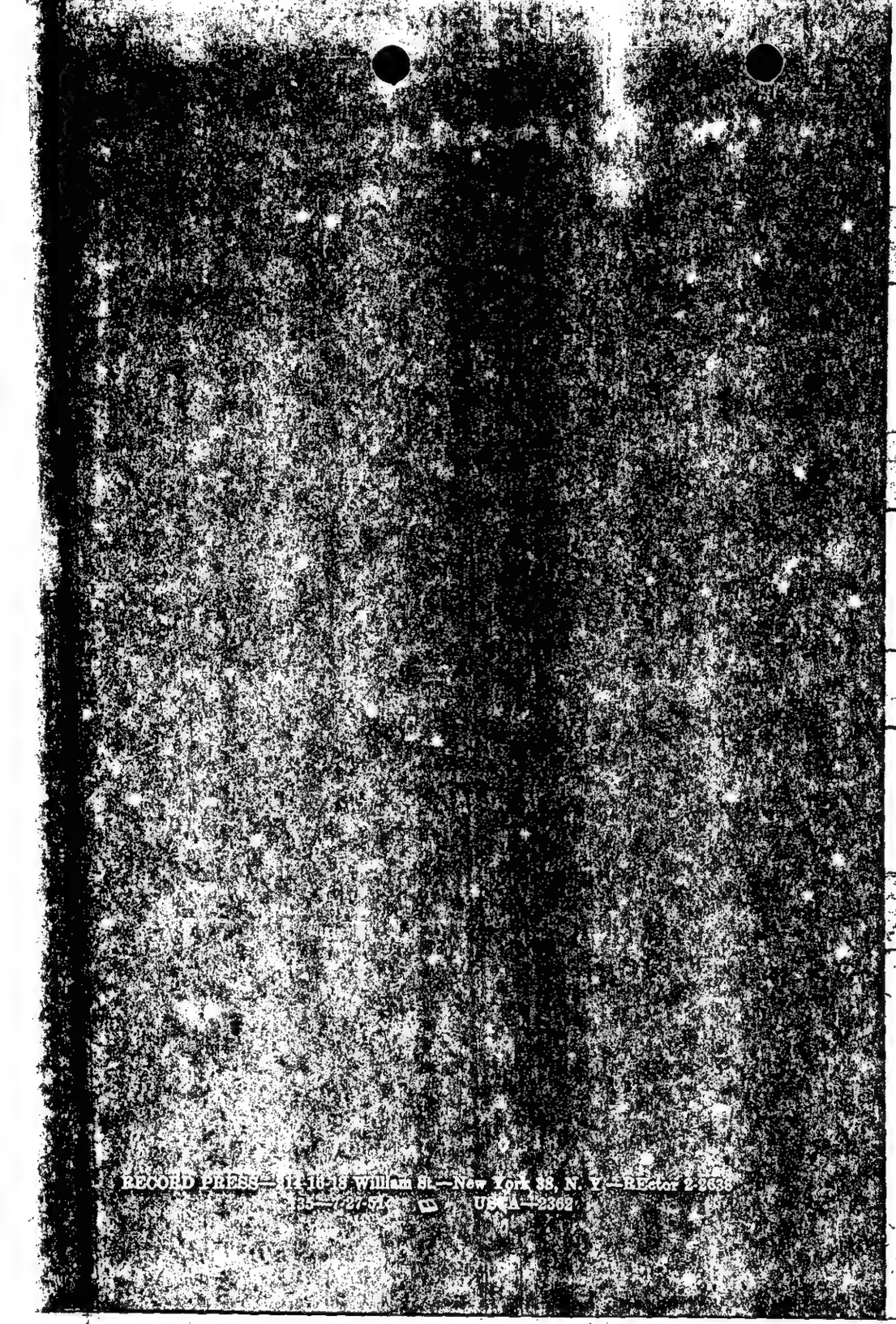
We turn now to Brothman's appeal. The court's charge limited the substantive crime to endeavoring to influence Gold to give false testimony, and the jury was told that the Government did not have to prove the success of the

---

[1] See *Lyden v. United States*, 3 Cir., 296 F. 101; *Barnes v. United States*, 3 Cir., 5 F. 2d 832.

[2] See *Lefkowitz v. United States*, 2 Cir., 273 F. 664, 668, cert. den. 257 U. S. 637; *United States v. Shapiro*, 2 Cir., 103 F. 2d 775, 776; *United States v. Di Carlo*, 2 Cir., 64 F. 2d 15, 17; *United States v. De Vasto*, 2 Cir., 52 F. 2d 26, 30, cert. den. 284 U. S. 678; *Boehm v. United States*, 3 Cir., 123 F. 2d 791, 810.

endeavor. Concededly all of Brothman's "endeavors" to influence Gold's testimony took place in the eastern district of New York, although Gold's testimony was given in the southern district. The contention on appeal is failure of proof of venue. At the close of the prosecutor's case, Brothman moved for a directed verdict on count 2 on the ground that the evidence was insufficient. This motion was renewed at the end of the entire case. The Government's only answer to the appellant's argument is that Brothman waived his constitutional privilege to be tried where the crime was committed by going to trial in the southern district without objection. Where the indictment discloses lack of venue, going to trial without objection to venue is a waiver. *United States* v. *Jones*, 2 Cir., 162 F. 2d 72, 73. There is a dictum in *United States* v. *Michelson*, 2 Cir., 165 F. 2d 732, 734, aff'd, 335 U. S. 469, that the same result may follow if the defendant is warned of the defect during the course of the trial. In the case at bar Brothman could not know that venue would not be proved until the prosecutor's evidence was closed; he then moved for a directed verdict. We may assume *arguendo* that he argued the motion and said nothing about failure to prove venue, he might be held to have waived the defect. But the motion was denied without argument being heard. In *United States* v. *Jones*, 7 Cir., 174 F. 2d 746, Judge Minton (now Mr. Justice Minton), speaking for the court, held that a motion for acquittal made at the conclusion of all the evidence properly raised the question of venue in the court below. Such a motion need not specify the grounds therefor. We agree with the Seventh Circuit decision. Accordingly Brothman's conviction on count 2 must be reversed. The conviction of both appellants on the conspiracy count is affirmed.



RECORD PRESS—11-13 William St.—New York 38, N. Y.—REctor 2-3638
35—7-15-5 USA—2362

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 7/20/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E.Thompson

Address Warden, Federal Detention Headquarters

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

128. Photostatic copy ofpaper entitled "Drawing #1" together with envelope addressed to N. GABORIAULT, Pres., Techniflex Corp, Port Jervis,NY
129. Photostatic copy of paper entitled "Drawing #2" together with envelope addressed to OSCAR THALER, 3107 Bedford Avenue, Brooklyn,NY.
130. Photostatic copy of drawing showing various views and positions of a color television tube.

100-95068-1B

SEARCHED INDEXED
SERIALIZED FILED
AUG 2 3 1951
FBI - NEW YORK

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 7/30/51

ABRAHAM BROTHMAN

100-95068-1B

(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal House of Detention

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

131. Photostatic copy of paper entitled "Drawing #3."
132. Photostatic copy of paper entitled "Drawing #4."
133. Photostatic copy of paper entitled "Drawing #5."
134. Photostatic copy of paper entitled "The Miriascope for 20" Rectangular C R Tube.
135. Photostatic copy of envelope addressed to N. GABRIAULT.

100-95068-1B

SEARCHED ... INDEXED
SERIALIZED ... FILED
AUG 9 1951
FBI NEW YORK

Dec 43 P. 1.

Sheet #3 P.2

DWG. #1

1. Lt. Stem "F3"
2. 3/4" x 3/4" x 1/8" aluminum angle spoke
3. 1/2" x 1/4" x 1/16" aluminum angle rim
4. Indicates the position of the 6 open-spaced Permalloy plates on the assembled unit.
5. Aluminum hub (machine from 4" O.D. x 1/2" I.D. tube stock, as for a 4" steel stock pinion)
6. 6-equispaced (on a 3 3/4" P.C.D.) holes, drilled and tapped for 4-40 x 1/4" flat head machine screws, 1/4" lg.
7. 6-4-40 x 1/4" flat head machine screws, 1/4" lg.
8. Rear ball bearing, 1/4" shaft dia. (sunken fit into casing)
9. Aluminum cover plate (flange indicated as a 1/16" thk. plate, a 1/16" x 1/2" fillet would more than suffice)
10. 2 dowels
11. 2-1/4" diameter x 5/16" lg. expansion pins
12. 1/4" x 1/4" x 1/16" aluminum angle stock ring (R.H.) - ring to have 2.5" O.D.
13. roller support member for R.H. end of inner drum, - 6 equispaced units, - see Dwg. #1
14. Outer Drum End Ring (R.H. side)
15. Split Pillow Block (See Dwg. #3)
16. Field Coil anchor assembly for stationary shaft "F" mount (See Dwg. #5)
17. S.A.E. 1020 stainless steel tube stock, stationary shaft machined as per Dwg. #5
18. Hollow shaft component of C.C. Tube support assembly, - of seamless S.A.E. 1020 tube stock

19. ½" x 5" x 12" lg. leg attaching anchor member (16) to Hollow shaft (17)

20. Tongue member of anchor (see Dwg. # 5)

21. ⅝" x ½" lg. capscrews and nuts - 2 req.

22. Form saddle plate to weld (16) to Stud (see Dwg. # 5)

23. 1" x 1" x ¼" angle iron to weld (22) and welded (see Dwg. # 5)

24. ½ x ½" x 8" angle iron leg of R.H. end A-Frame (See Dwg. #5 for details and Four required for A-frame members to one another and to drum)

25. Roller Bearing Units 3-2321-16 Plain Cylindrical Bore Bronze bearings, (2 one each end as indicated, machine to fit with center of (17) and center

26. Outline of Table indicating relationship of Roller Bearing and ring R.H. spoke from table

27. ½" x 4" x 12" leg attaching bracket to Hollow shaft Member of C.R. Table Support Assembly

28. 2 - ½" x 4" lg. capscrews and nuts

29. ½" Mild Steel plate, re-inforced as indicated in Table Support Plate Detail

30. ½" x ½" x 5" angle iron stiffener, welded down length of the underside of (29)

31. ½" x ½" x ½" angle iron stiffener, running length of half-way across the underside of support plate (29) at each of its four point of support by bracket.

32. 3" x 3" x ½" x horizontal members of Bracket

33. Bracket (See Bracket Detail)

34. Pressed Steel Clip to weld to Bracket to which Lighter Cable Bracket is attached

Dwg. #2

35. 1" x 1" x ⅛" ∠ vertical member of Bracket

36. ¾" x 7" x 3" ∠ stiffener across width of underend of plate, welded to plate and to (30) as indicated on Front-End Elevation View of Tank Support Detail

37. Pin (42) and (43)

38. Rear of Tank Strap Member to Support Plate

39. Front Side Tank Strap Member (See Front End Elevation View of Tank Support Plate)

40. Web of Bracket, of 2½" O.D. x 1½" I.D. S.A.E. 1020 Standard steel tube stock

41. Stiffener of ¼" x ½" fg. key as per (37)

42. 1" x 1" x ⅛" ∠ each arm of Bracket

43. ⅛" Tie stiffener plate welded to angle arms & tube

44. Collapsed rubber tubing forming soft shoulder for bottom-side of C.P. Tube

45. Plywood block following contours of underside of tube

46. Rubber strap ¾" Tie for (39)

47. Plate (39)

48. Slot for ¾" diameter carriage bolt and wing-nut fastening between (39) and leg-member of strap

Bug #5

Page 1

1. Shoulder bearing against driven race of ball bearing in Outer Driven R.H. End Ring Nut [NOTE:- Shaft, at its reduced diameter, to be a shrinking fit into inner race.]
2. Keyway for ¼" x ¼" key fixing Stationary Shaft against rotation in pillow block [NOTE:- Keyway to extend for 4½" in length from indicated R.H. End of Shaft.]
3. Drill and Tap for ¼" stud or Screw to Attach into Stationary Shaft. Fit of relieved or tapped hole to be "Push fit". [NOTE:- Lower ¼" of stud to be machined down to ¼" Ø and to fit snugly into corresponding hole ⑩ in Outer Ring Nut. Shoulder on stud serves because of machined down end to rest Rigidly against inner Ball Race Nut.]
4. Keyway for ¼" x ¼" x 1½" lg. key between Stationary Shaft and Stationary Shaft Anchor.
5. Steering Arm Holes ⅜" Ø, ½" lg. of description on ③ rather than as indicated.
6. Keyway in Stationary Shaft Anchor matching ④
7. Entire Anchor to have a snug fit into Stationary Shaft
8. Length Number of Anchor
9. Drill for ¼" Ø Hole passing thro'
10. ¼" Ø stud for steering prong as mentioned on Item #3 above
11. Keyway for ¼" x ¼" x 1½" lg. key between Bracket Nut and Hollow Shaft
12. Inner Assembly
13. Split Pillow Block support for R.H. Inner Assembly
14. ¼" x ¼" x ¾" lg. Keyway for Anchor (to Item 4 and "4C")
15. Note ⑤

16. Frame Angle Braces (2) as req'd.

17. 1" x 1" x ¼" Angle Horizontal member to which (16) are welded (See Items "B" and "D")

18. Gusset Plate (See Item "G"). [NOTE: Actually used gusset plate, which is 1" thick as opposed by Item "B"] — ¼" R

19. Gusset Plate (See Items "E" and "B") — ¼" R

20. 1" x 1" x ¼" Angle Horizontal member serving as stiffener and to which the top ends of uprights and as a Rail to which the corrugated sheet metal protection element is attached.

21. 2½" x 1" x ¼" Angle Iron uprights

22. Base Plate (See Detail "F")

23. 1" x 1" Steel Angle Braced to upright by way of slope

24. Gusset Plate (See Item "H")

25. Gusset Plate (See Item "I")

26. Building Foundation

MR. N. GABORIAULT PE5
TECHNIFLEX CORP.
PORT JERVIS, NEW YORK

PERSONAL

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 8/3/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal Detention Headquarters, N C

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

136. One photostatic copy of paper entitled "Drawing # 6.
137. One photostatic copy of paper entitled "Drawing #7.
138. One photostatic copy of drawing e titled "The Miriascope for a 20" Rectangular C R Tube Drawing #6.
139 One photostatic copy of drawing entitled " The Miriascope for a 20" Rectangular C R Tube Drawing #7.

100-95068-1B

SEARCHED INDEXED
SERIALIZED FILED
AUG 3 1951
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1. [illegible] Thrust Bearing (Rot-Bronze) — [NOTE:
[illegible] Value", ⑦, called for a solid cast Thrust bearing
[illegible] under that the finished construction of the thrust bearing
[illegible] No. 1

2. [illegible] welded, welded as indicated to one leg of the support
[illegible] ⑨

3. [illegible] structural steel

4. [illegible] complete [illegible] solenoid as anchored

5. [illegible] replacement [illegible] — Any

6. [illegible] Full-force [illegible] 60 cycle solenoid, equipped
[illegible] ⑤

7. [illegible] complete

8. [illegible] steel angle

9. [illegible] ⑥ [illegible]

10. [illegible]

11. [illegible] bearing guide [illegible]

12. [illegible]

13. [illegible] — Any

14. [illegible] 1020 seamless steel tubestock, welded to
[illegible]

15. [illegible] ½" Rot-Bronze bearing

16. [illegible] ⑪

17. [illegible] ½" shell end gear fitted into [illegible] ½" thk. connector
link ⑫

18. [illegible] thk connector link, fitted by any suitable means to
plunger member of solenoid ⑤

19. ⅜" R. mild steel gusset, welded to inside of one leg of ⑤ and to baseplate. [NOTE:- ⑨ should be similarly stiffened in the other direction as well.]
20. Keyway for ¼" x ¼" x ½" lg. key between Main Drive Shaft and the hub of the Inner Drum Driven-End End Ring
21. Allen Headless Setscrew used to fix commutator holder unit end of Main Drive Shaft. [NOTE:- With the setscrew engaged, the top of setscrew is beneath the root of the indicated thread. Threading of the shaft is to be done after the hole for the setscrew has been drilled and tapped.]
22. ½" Dia. Jack-nut Thread, medium fit-to-backing-up nut. [NOTE:- Backing-up nut to be driven with a lock-washer against the inner race of the ½" shaft-size bearing.]
23. Keyway for ¼" x ⅛" x ⅜" lg. key between gear ㉑ and Main Drive Shaft
24. Commutator & Lever assembly for relay circuit
25. ½" shaft size ball bearing pillow block
26. Drive motor (further information, next communication)
27. Output shaft of drive motor, to be taken to be ½" Ø
28. Helical Gear (specified on Dwg. #1) on output shaft of motor
29. " " (" " " " ") " Main Drive Shaft
30. 1¼" shaft size ball bearing pillow block
31. ¼" Ø. capscrew threaded into baseplate ㊸
32. ~~½" R. mild steel~~ composite outboard bearing for output shaft of Motor Drive
33. ¼" Ø capscrew and bolt to baseplate ㊷
34. spoke of Outer Drum Driven-End End Ring

35. Anchor for Lower Drum Driven - End End Ring
36. Rivets " " " " " " " "
37. 2" x 2" x 12" lg. key between Main Driven Shaft and Lower Drum Driven End End Ring
38. 2" x 2" x ¼" Structural steel ∠ lgs. Longitudinal member of L.H. A-frame
39. 2" x 2" x ¼" " " " ∠ lgs of L.H. A-frame
40. Longitudinal brace bar of A-frame Ends - Same for template (42)
41. Rivets " " " " " " " " " "
42. ½" R. round steel baseplate for A-frame and anchor lg
43. Baseplate for 1¼" shaft - Lgs for Lower Shaft
44. Expansion and Nut for connecting rod to baseplate (47) - 1 req.
45. 2½" x 2½" x ¼" Structural steel ∠ stiffener for baseplate (47) - 2 req.
46. ½" R. round steel guard lgeng (47) to baseplate (43)
47. ½" R. round steel baseplate for Lower Shaft
48. ½" R. expansion threading rod baseplate (43) to Nut (48) to (43)
49. 2" x 2" x ¼" lg. expansion and nut lgeng baseplate (43) to Lower Drum Driven (50)

IG No. 7

1. 7/16" S. x 3/4" lg. std. sld. mach. screws – 6 req.
2. 1/16" R mild steel cover-plate for outboard bearing.
3. Rec. 1600 Series 1/2" shaft-size ball bearing
4. ~~3" x 3" x 1" tube steel casing for ball bearing~~ Housing for ball bearing from 1 3/4" O.D. x 1" I.D. seamless steel S.A.E. 1020 tube-stock
5. drill and tap for 1/4" S. capscrew
6. outboard bearing for output shaft of motor drive
7. drill and tap for 1/4" S. capscrews clying 1" shaft-size ball bearing pillow block to pad plate
8. longitudinal centerline of L.H. end drive assembly
9. 1/4" Tk. pad plate (mild steel)
10. Position "B"
11. Boat Assembly } all three are to be rotated 30° counter-clockwise for true positions
12. Position "A"
13. Bow Assembly
14. Horizontal Member of Knee-Brace Supports, of 3/4" x 3/4" x 1/8" structural steel
15. 1" x 1" x 1/8" structural steel top-member of L.H. A-frame
16. 1/8" R mild steel gusset plates – 2 req., running between (15) and (19)
17. steel supports of Knee-Brace Supports, of 3/4" x 3/4" x 1/8" structural steel
18. 3/4" x 3/4" x 1/8" longitudinal member of L.H. A-frame
19. main leg of L.H. A-frame, of 3/4" x 3/4" x 1/8" structural steel
20. fixture for attachment of Positioner "B" – see Detail "F"; Item "F-B"
21. " " " " " "A" – " " " " " " "F-D"

22. ½" R mild steel baseplate for attachment of Brake Assembly (11)
23. ½" R " " " stiffener plates for (22)
24. 1" x 1" x ½" structural steel ∠ as horizontal member of L.H. A-frame
25. ½" R mild steel gussets - 2 req'd, running between (19) and (24)
26. Not used - See details of R.H. A-frame
27. ½" R mild steel gusset plate running between bottom plate of Positioner "3" fixture and one leg of (19)
28. ½" R mild steel vertical baseplate of Positioner "3" fixture number
29. ½" R mild steel gusset between bottom plate and (28) of Positioner "3" assembly fixture
30. Second gusset plate, identical with (29)
31. Note - The true shape of (27) and the position of (29) with respect to the true axis of (19) are to be such as to satisfy the orientation axes indicated for the fixture in Item "F" figure
32. ½" R mild steel gusset running between (33) and one leg of (19)
33. ½" R mild steel bottom gusset running between (33) and the other leg of (19)
34. Bottom plate member of Positioner "A" attachment fixture
35. Second gusset running between (33) and (34)
36. Vertical Support of Positioner "A" attachment fixture
37. Note - The true shapes of (31) and (32) are to be such as to satisfy the orientation axes indicated for the fixture on Sheet "F A"

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 7/30/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E.Thompson

Address Warden, Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit Incabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

140. Two photostatic copies of drawing entitled "The Miriascope For a 20" Rectangular C.R.Tube, Drawings 4 & 5" together with photostatic copy addressed to N. GABORIAULT, Pres, Technifiex Corp, Port Jervis,NY

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100-95068-1B

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 8/13/51

ABRAHAM BROTMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E.Thompson

Address Warden, Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit retain

List of contents:

141. Two photostatic copies of letter dated 8/10/51 to J.F. & S.E.A.
142. Two photostatic copies of paper entitled "Errata, Addenda, & Comments.
143. Two photostatic copies of pages numbered 112-117.
144. Two photostatic copies of paper entitled Drawing #8 together with drawing.
145. Two photostatic copies of paper entitled Drawing #9 together with drawing.

8/10/51

To:- J. F.
S. E. A.

Re:- Synchronizing Arrangements
for C.B.S. color-TV

Today

I met John J received from Paris today indicated that
[illegible] relative to the construction of a special motor f
color wheel or color-drive unit had been misconstrued.
[illegible] Jack, it occurred to me the thought that S.L.
[illegible] of a special combination of a synchronous-an
motor (a specially constructed motor) which would
[illegible] to the vertical [illegible] pulse via any of a number of
[illegible] In the mean time Jack Poppele
[illegible] such a project both from a technical and from a
[illegible] point of view I am inclined towards Lenco-type
[illegible] pulse and the Dumont pulse, as differentiated
[illegible] I have seen that C.B.S. uses I believe that the
[illegible] motor should operate something
[illegible] in its operation. Remember then a returnable
[illegible] thought or whether I invented a decision was
[illegible] time never to design a drive of the type I
[illegible] whether I should leave this till later and proce
[illegible] Jack's order with the design of a larger size (
[illegible] wheel — say a color-wheel for a 14" tube).
I believe that the drive motor which I have in mind, a
[illegible] an eddy current (a very light eddy current)
[illegible] standard motor would be especially adapted to the
[illegible] designed.

[illegible] discuss this with S.L. and let me have your
[illegible] informed today that drawings 6, 7, 8 & 9 sent Friday of la
[illegible] Wednesday of this week or two local shipments have not arrive
[illegible] contained in these drawings is most essential to the devel
[illegible] Please see that the finished device meets these drawi
[illegible] recommendations of the original design are sustained on these

8/11/51

To: J. F.
S. E. A.

Re:- Synchronizing Arrangements
for C.B.S. color-TV

Today

A note which I received from Harris today indicated that
perhaps my memory relative to the construction of a special motor for
CBS color-wheel or color-drum units had been inaccurate. In
my last talk with Jack, he conveyed to me the thought that S.L.
was that of a servo of a special combination of a synchronous- and
an induction motor (a specially constructed motor) which would
"lock" to the vertical scanning pulse via any of a number of
servo linkages. In the message I gave Harris, I expressed my
opinion against such a project both from a technical and from a
commercial point-of-view. I am inclined towards Servo-type lin
between the vertical pulses and the Drive Motor, but, as differentiated
from the servo I have seen that CBS uses, I believe that the
driving or pacing section of the servo should operate something
less variable in its operating characteristics than a saturable
reactor. My thought on which I asserted a decision was when
I should take the time now to design a servo of the type I ha
in mind, or whether I should leave this till later and proceed
according to Jack's orders with the design of a larger size (la
diameter) color-wheel - say a color-wheel for a 14" tube)
immediately. I believe that the servo which I have in mind, an
would employ an eddy current (or very light eddy current) b
against a standard motor would be especially adapted to the b
drive. I could design.

Please discuss this with S.L. and let me have your o

Harris informed today that drawings of T, S, & T and Talley of la
sample tube) and details of this work in two weeks should have not arriv
material contained on these drawings is most essential to the drive
& construction. Please see that the following records these drawing
any important revisions of the original designs are contained on them.

ERRATA, ADDENDA, & COMMENTS

RE:- PAGES 101-111.

* *

IMPORTANT

[NOTE:- Clock relay C9 on Dwg. #9. The set of contacts in C9 allowing power supply to the Drive Motor should be a normally-closed set. If Dwg. #9 indicates otherwise, it should be viewed in this regard.]

* *

DIFFERENCES BETWEEN THE ORIGINALLY-SUBMITTED CONTROL CIRCUIT & THE ONE GIVEN ON DWG. #9

A proposed control circuit for the Microscope was submitted on Sheet #19 of the original group of sheets; and, the originally-submitted Control Circuit was the basis of the document, pages 101-111, entitled "Description of the Dark Alignment Control Circuit". Since the "Microscope Control Circuit" as submitted on Dwg. #9 differs in some respects from that given on Sheet #19, the descriptive material given on pages 101-111 will not correspond exactly to the facts of the latterly-submitted circuit. Therefore, this document is submitted to amend and correct page 101-111 wherever this is required.

The "Microscope Control Circuit" as given on Dwg. #9 differs from that given on the above-mentioned Sht. #19 in the following principal respects:-

a) The signal from the downstream side of the normally-open set of load contacts in the Inverter Relay C3 is now fanned to the timing relay C8 and to the Solenoid of

Positimer "A" via a normally-closed set of load contacts in the mechanically-held relay C16; while, on Sht. #19, the same signal is passed directly from the mentioned set of load contacts in C3 to C8 and C6 without any interposed relay effects;

b) on Dwg. #9, C15 is indicated as a mechanically-held relay, while on Sht. #19 it appears as a conventional relay;

c) on Dwg. #9, the mechanically-held relay C9 appears as a 3 N.O. - 1 N.C. unit, the mechanically-held relay C10 as a 3 N.O. - 1 N.C. unit, and the mechanically-held relay C7 as a 2 N.O. - 1 N.C. unit. On Sht. #19, C9 appeared as a 2 N.O. - 2 N.C. unit, C10 as a 2 N.O. unit, and C7 as 1 N.O. - 1 N.C. unit;

and

d) in correspondence to the above-mentioned equipment changes, certain details of the functional patterns have been altered.

The addition of C16 to the circuit as per (c) has been for the purpose of providing for the disengagement of C6 and C8 after the re-alignment of the frame for black-and-white viewing has been achieved. By so doing, any A.C. clatter associated with the continued engagement of C6 [the solenoid member of Positimer "A"] and C8 [the re-cycling timing relay] is eliminated, and, further, any disturbing effects due to a continued feeding of these equipment items is eliminated.

Associated with the addition of C16 to the "black-and-white" alignment section of the control circuit are the above-noted changes in the specifications for C10 and C7 and, in part, the changes in the specifications for C9. From a reading of pages 101 - 111, it will be observed that:-

A. when the arresting of the Drum Assembly and the disengagement of the latch-plunger from Slot "A" is accomplished as the first step in the re-alignment of the two drums for black-and-white viewing, C9 is engaged;

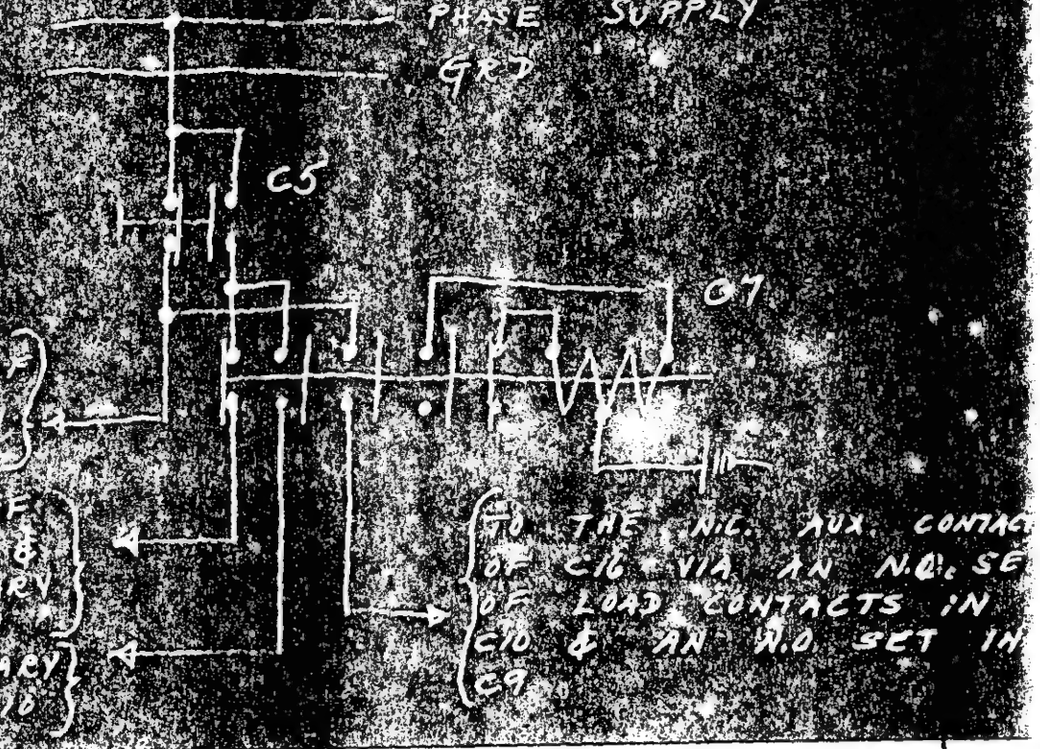
B. after C9 is engaged following the events mentioned in (A), C10 is engaged;

and,

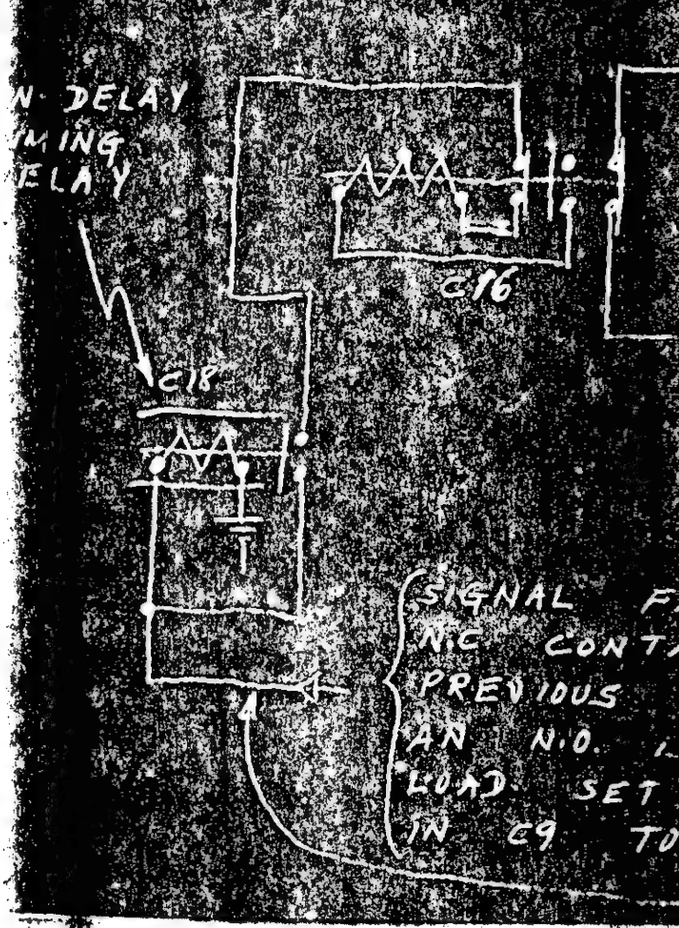
C. after C10 is engaged as a consequence of the engagement of C9 and after the ensuing motion of Drum #2 alone results in the return of the latch-pawl to a position where it no longer keeps the actuator of the Current-limit Switch, C7 is engaged.

Studying the Maintenance Control Circuit as given on Dwg. # 9, it will be seen that when C7 and C9 are engaged, and C10 is disengaged, a path is opened for a signal existing from plate supply, and after transmission over an appropriate set of contacts in each of the mentioned relays, terminating at the normally-closed set of auxiliary contacts of the mechanically-held relay C16. The necessary conditions for the open-path, namely that C7 and C9 be engaged while C10 be disengaged, are fulfilled as a sequel to Item (C) above. From pages 109-111, it will be found that after C7 is engaged as per (C) above, C10's disengagement is made responsive to a signal starting from the normally-open set of contacts in the limit switch C3. The signal noted is transmitted across a normally-open set of hold contacts on C9 to the normally-open set of auxiliary contacts on C10 across which the latch-pawl of Drum # 2 has already mounted the raised block of Slot "B" during the Drum's travel towards the black-and-white viewing required position. It will also be found on the "Description" pages 109-111, that the mounting of the raised block of Slot "B" by the latch-pawl member of Drum # 2 is followed shortly thereafter by a locking of the latch-pawl

in the grab-slot of Knob "B", signifying the arrival of Drum #2 at a position which is consistent with a proper alignment of the clear slot of Drum #2 with a clear slot in Drum #1 for the purpose of black-and-white viewing. Thus, once the signal which would engage C16 (and consequently disengage C6 [the solenoid of Position "A"]) occurs when the locking action between the two Drums is impending rather than completed, it may be argued that a possibility exists that the ultimate absorbing of the flywheel energy of Drum #2 and the rotor of the Drive Motor could act to rotate the Drum Assembly's position past the 'window' in the cabinet. To obviate this possibility, it would be possible practical to draw the prime signal for the disengagement of C16 from the downstream side of the normally-closed set of contacts of C5 instead of from phase supply as now indicated on Dwg. #9. This change is illustrated below:-



By the scheme illustrated above, the signal engaging C16, and consequently disengaging the Drum Assembly-arresting action of the plunger of Positioner "A", would await the completion of the locking-action between the Drums. The means as well, that the newly-aligned Drums would be prevented from slipping past the 'window' in the cabinet. Any further assurance that the newly-aligned Drums should not slip past the 'window' would be obtained from introducing a time-delay factor between the completion of the afore-mentioned locking-action and the retraction of the Plunger of Positioner "A" from the "drill-slot of Shaft "A". If this were done, then a way of doing it would be as indicated below:-



Of the matter raised on page 202, only one has thus far not been discussed, and this is Item (b) dealing with relay C15. On Dwg #19, as is recalled in Item (b), C15 was indicated as a conventional relay; while on Dwg #9, it appears as a mechanically-held relay. Two reasons underlie the change, of which the first is the more important -

1. Dwg #19 indicates that the prime signal for the engaging of C15 originates at the N.C. contacts of C5, is transmitted across an N.O. bead set in C9 to an N.O. set in C14, is then transmitted across an N.O. set in C14 to an N.C. bead set in C12 to an N.O. set in C11, and, finally, is then applied to the plate-side of the operating coil of the conventional relay C15. This would demand that C9 be in its engaged position, C14 be engaged, that C12 be disengaged, and that C11 be engaged for C15 to be continuously engaged during color viewing. However, since the engagement by C14 is dependent on C15 being disengaged, it follows that the engagement of C15 would lead to the disengagement of C11, which would in turn lead to the secondary disengagement of C15 ——— and ultimately to a chattering relationship between C14 and C15. This is the prime reason for the change shown on Dwg #9.

2. The second reason lies in the inadvisability of C15, or any other relay, being continuously energized during the operation of the TV circuit, since A.C. related electrical disturbances to the operation of the TV circuit are possible. By making C15 a mechanically held relay, the permanent engagement of C15 prior to

the disengagement of C14 is assured; and, once the engagement of C15 is established, it holds that engagement without any further feed of power. The latter fact satisfies the above-mentioned conditions that no member of the switching circuit be capable of "chattering" or demand a continued feed of power during any viewing cycle, other than — possibly — the Facilmeter Relay.

As C15 is now specified, its engagement follows the completion of the drum-realignment action, for the engagement signal is transmitted along the following path:-

a) the signal originates at the downstream side of the N.C. contacts of C5, which means that the latch-pawl of Drum #2 must be in its "low" position;

b) the signal as of (a) is relayed across a normally-open load set in C9, which means that C9 should be engaged — and this condition is satisfied since C9's pawl is released only after C15 is engaged;

c) the signal as of (b) is applied from the downstream side of the N.O. load set in C9 to the upstream side of an N.O. set in C14, which means that C14 must be engaged for the further relaying of the signal — and this is satisfied since C14 is engaged only as C2 is in its color-position and C15 is also engaged;

d) the signal as of (c) is applied from the downstream side of the N.O. set in C14 to the upstream side of an N.O. set in C12, which means that C12 must be engaged for the further relaying of the signal

— and this condition is satisfied by the fact that C12 is restored to its disengaged position once the latch-pawl of Drum #2 is brought to a given state of 'lift' by the approach block of Groove "A"

and,

c) the signal as of (d.) is relayed from the downstream end of the N.C. lead set in C12 to an N.O. lead set in C11, which means that C11 must be in its engaged position for further relaying of the signal — and this condition is satisfied by the fact that C11 is sent into its engaged position by the 'drift' of Drum #2 past the departure block of Groove "3" during the travel of Drum #2 towards its color-realigned position with Drum #1, and further C11 maintains its engaged position until the next black-and-white allowing alignment is signalled.

The signal as of (c) is then applied to C15. Since the 'lift' of the latch-pawl by the approach block of Groove "A" imminently precedes the locking of Drum #2 into its color-alignment position with Drum #1, it follows that C15 is engaged only as color-alignment of the two drums is achieved or is imminently about to be achieved. By the refinement of the Control Circuit given on Page 113, it would follow that C15 would ~~also~~ engage to release Pointer "3", disengage C14, and restore C9 and C7 to their disengaged positions, only after color-alignment of the two drums has been achieved.

This Sta. (b) on Page 202 is replaced.

TWO IMPORTANT CONSIDERATIONS:

Two important considerations underly the projected design of the Control Circuit. They are:-

a) the type of mechanically-held relay used.

and

b) the stacking behind the release of "section "A" after Black-and-white alignment has been achieved.

It has been repeatedly set forth above that one of the functions served by the use of mechanically-held relays was to eliminate "chatter" and electrical disturbances to the operation of the TV receiver when the functional demands of any given relay demands its sustained engagement. This set of qualifications more or less defines the type of relay which is required. Explicitly, it would be required that:-

1) the holding of the relay's engaged position be accomplished either by a mechanical or a magnetic latch

and

2) a solenoid operating coil which chronos the mechanical or magnetic latching action be a part of the relay

Inherent latch for the holding of relays in their engaged positions are extremely common, and, in fact, the name — mechanically held relays — is derived from the original use of such mechanical latches. More recently, it has been common to replace mechanical latches by permanent magnets which hold the relay-plunger once the plunger is drawn against the permanent magnet pole-face. The latter type of construction, which has been referred to as a magnetic latch, is preferred here, since strictly mechanical latches are subject to improper operation when the baseboards to which they are attached are jarred.

Finally as regards the mechanically-held relays used, it

should be observed that to ensure the best operation of such a relay, the two operating coils of the relay — the one which acts to engage the relay, and the other which acts to disengage or de-latch the relay — should be supplied from auxiliary contacts which are operated in unison with the load contacts. The contacts which are auxiliary to the engaging action — the N.C. auxiliary contacts — should have a dragging effect incorporated in them to ensure the completion of the engaging action against a spurious or chattering making action.

In the construction selected for the models permitted, I will design a set of linkage suited for use with the electrostatic field control circuit.

In the height of the design I designate Position "A" as the best and exact alignment of the linkage has been achieved. It has been laid down that the centres of the linkage assembly and the drawbar axis, plus the factor of the linkage between the contacts and the transmissions should be sufficient to hold any previously established position once the desired linkage assembly alignment and positioning in front of the relevant window has been achieved. The factor required that a continued engaging of the relay solenoid might lead to chattering and also the electrical disturbances to the T.V. circuits. Normal operation led to a series of two solutions:-

A. To allow contact with Position A only momentarily - held here,

or,

B. Hold any given linkage assembly position on the basis of the inertia and friction forces named above.

The latter was chosen for the reason of the costs involved in the former alternative.

* Note: Pages 205 and 206 are missing.

ERRATA, ADDENDA, & COMMENTS

RE:- PAGES 101-111

* * * * * * * * * * * * * * * *

IMPORTANT

[NOTE:- Clock relay C9 on Dwg. #9. The set of contacts in C9 allowing plate supply to the Drive Motor should be a normally-closed set. If Dwg. #9 indicates otherwise, it should be revised in this regard.]

* * * * * * * * * * * * * * * *

DIFFERENCES BETWEEN THE ORIGINALLY-SUBMITTED CONTROL CIRCUIT & THE ONE GIVEN ON DWG. #9:-

A proposed control circuit for the Mercasage was submitted as Sheet #19 of the original group of sketches, and, this originally-submitted Control Circuit was the basis of the document, pages 101-111, entitled "Description of the Dwell-Alignment Control Circuit". Since the "Mercasage Control Circuit" as submitted on Dwg. #9 differs in some respects from that given on Sheet #19, the descriptive material given on pages 101-111 will not correspond exactly to the facts of the latterly-submitted circuit. Therefore, this document is submitted to amend and correct pages 101-111 wherever this is required.

The "Mercasage Control Circuit" as given on Dwg. #9 differs from that given on the above-mentioned Sht. #19 in the following principal respects:-

a) [On Dwg. #9,] the signal from the downstream side of the normally-open set of load contacts in the Tachometer Relay C3 is passed to the timing relay C6 and to the solenoid of

Positioner "A" via a normally-closed set of load contacts in the mechanically-held relay C16; while, on Sht. #19, the same signal is passed directly from the mentioned set of load contacts in C3 to C8 and C6 without any interposed relay effects;

b) on Dwg. #9, C15 is indicated as a mechanically-held relay, while on Sht #19 it appears as a conventional relay;

c) on Dwg. #9, the mechanically-held relay C9 appears as a 3 N.O. - 1 N.C. unit, the mechanically-held relay C10 as a 3 N.O. - 1 N.C. unit, and the mechanically-held relay C7 as a 2 N.O. - 1 N.C. unit. On Sht. #19, C9 appeared as a 2 N.O. - 2 N.C. unit, C10 as a 2 N.O. unit, and C7 as 1 N.O. - 1 N.C. unit;

and,

d) in correspondence to the above-mentioned equipment changes, certain details of the functional patterns have been altered.

The addition of C16 to the circuit as per (a) has been for the purpose of providing for the disengagement of C6 and C8 after the re-alignment of the Drums for "black-and-white" viewing has been achieved. By so doing, any A.C. clatter associated with the continued engagement of C6 [the solenoid member of Positioner "A"] and C8 [the on-delay timing relay] is eliminated; and, further, any disturbing effects due to the continued feeding of these equipment items is eliminated.

Associated with the addition of C16 to the "black-and-white" alignment section of the control circuit are the above-noted changes in the specifications for C10 and C7 and, in part, the changes in the specifications for C9. From a reading of pages 101-111, it will be observed that -

A. when the arresting of the Drum Assembly and the disengagement of the latch-pawl from Point "A" is accomplished as the first step in the re-alignment of the two drums for black-and-white viewing, C7 is ~~done~~ engaged;

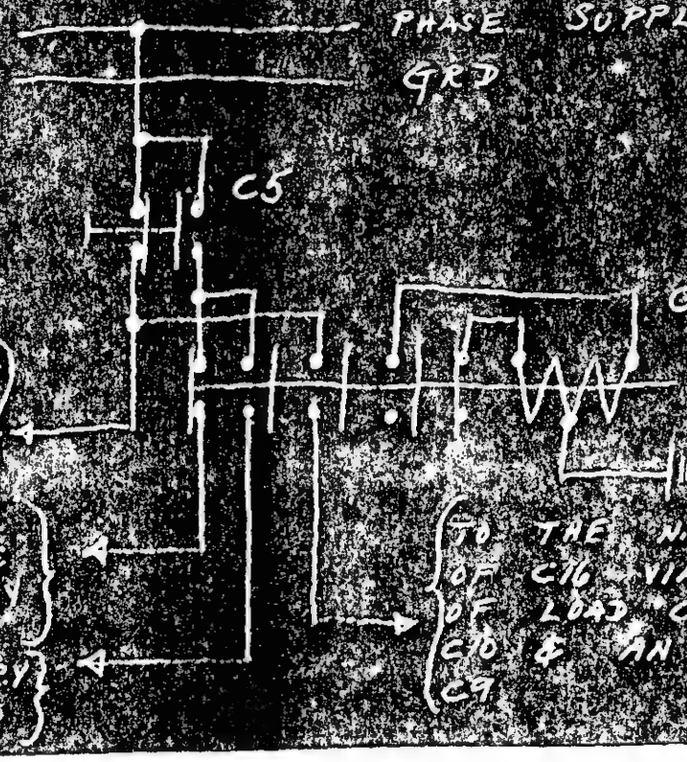
B. after C9 is engaged following the event mentioned in (A), C10 is engaged;

and,

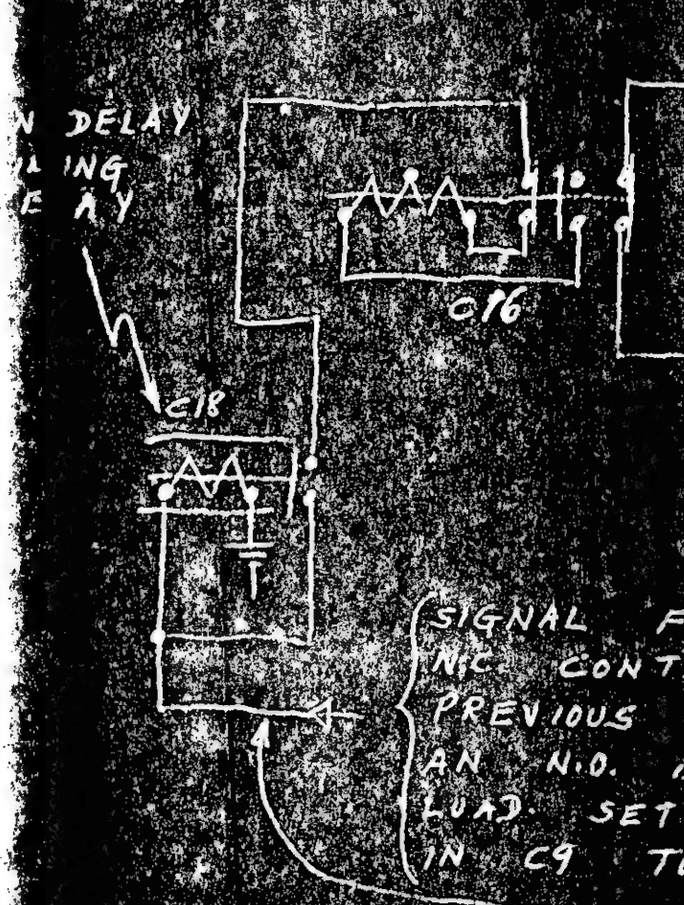
C. after C10 is engaged as a consequence of the engagement of C9 and after the resulting motivation of Drum #2 above results in the return of the latch-pawl to a position where it no longer trips the actuator of the Pressure Limit Switch, C7 is engaged.

Studying the Mechanical Control Circuit as given on Dwg. # 9, it will be seen that when C7 and C9 are engaged, and C10 is disengaged, a path is opened for a signal starting from phase supply, and after transmission over an appropriate set of contacts in each of the mentioned relays, terminating at the normally-closed set of auxiliary contacts of the mechanically-held relay C16. The necessary conditions for the opened path, namely that C7 and C9 be engaged while C10 be disengaged, are fulfilled as a sequel to Items (A) and (B) above. From pages 101-111, it will be found that after C7 is engaged as per (C) above, C10's disengagement is made responsive to a signal starting from the normally-open set of contacts in the limit switch LS5. This signal which is transmitted across a normally-open set of closed contacts in C9 to the normally-open set of auxiliary contacts in C10 occurs when the latch-pawl of Drum #2 has already tripped the approach block of Point "B" during the Drum's travel towards its black-and-white viewing reversal position. It will also be found in the "Description....", pages 101-111, that the mounting of the approach block of Point "B" by the latch-pawl member of Drum #2 is followed shortly thereafter by a locking of the latch-pawl

in the grab-slot of Track "B", signifying the arrival of Drum #2 at a position which is consistent with a proper alignment of the clear slot of Drum #2 with a clear slot in Drum #1 for the purpose of black-and-white viewing. Thus, since the signal which will engage C16 (and consequently disengage C6 [the solenoid of Positioner "A"]) occurs when the locking action between the two Drums is impending rather than completed, it may be argued that a possibility exists that the ultimate absorbing of the flywheel energy of Drum #2 and the rotor of the Drive Motor could act to rotate the Drum Assembly's position past the 'window' in the cabinet. To obviate this possibility, it would be possible practical to draw the prime signal for the disengagement of C16 from the downstream side of the normally-closed set of contacts of C5 instead of from phase supply as now indicated on Dwg. #9. This scheme is illustrated below:-



By the scheme illustrated above, the signal engaging C16, and consequently disengaging the Drum Assembly-arresting action of the plunger of Positioner "A", would await the completion of the locking-action between the Drums. This means as well that the newly-aligned Drums would be prevented from slipping past the 'window' in the cabinet. Any further assurance that the newly-aligned Drums should not slip past the 'window' should be obtained from introducing a time-delay factor between the completion of the afore-mentioned locking-action and the retraction of the Plunger of Positioner "A" from the drill-hole of Knob "A". If this were done, then a way of doing it would be as indicated below:-



Of the matters raised on page 202, only one has thus far not been discussed, and this is Item (b) dealing with relay C15. On Sht. #19, as is recalled in Item (b), C15 was indicated as a conventional relay; while on Dwg #9, it appears as a mechanically-held relay. Two reasons underlie the change, of which the first is the more important:-

1. Sht #19 indicates that the prime signal for the engaging of C15 originates at the N.C. contacts of C3, is transmitted across an N.O. load set in C9 to an N.O. set in C14, is then transmitted across an N.O. set in C14 to an N.C. load set in C12 to an N.O. set in C11, and, finally, is then applied to the plate-side of the operating coil of the conventional relay C15. This would demand that C9 be in its engaged position, that C14 be engaged, that C12 be disengaged, and that C11 be engaged for C15 to be continuously engaged during color-viewing. However, since ~~C14~~ the engagement by C14 is dependent on C15 being disengaged, it follows that the engagement of C15 would lead to the disengagement by C14, which would in turn lead to the secondary disengagement of C15 —— and ultimately to a chattering relationship between C14 and C15. This is the prime reason for the change shown on Dwg #9.

2. The second reason lies in the inadmissibility of C15, or any other relay, being continuously energized during the operation of the TV circuit, since A.C. chatter and electrical disturbances to the operation of the TV circuit are possible. By making C15 a mechanically-held relay, the permanent engagement of C15 prior to

the disengagement of C14 is assured; and, only, the engagement of C15 is established, it holds that engagement without any further feed of power. The latter fact satisfies the above-mentioned conditions that no member of the switching circuit be capable of "clattering" or demand a continued feed of power during any working cycle, other than — possibly — the Jackpot Relay.

As C15 is now specified, its engagement follows the completion of the drum-re-alignment action, for the engagement signal is transmitted along the following path:—

a) the signal originates at the downstream side of the N.C. contacts of C5, which means that the latch-pawl of Drum #2 must be in its "low" position;

b) the signal as of (a) is relayed across a normally-open load set in C9, which means that C9 must be engaged — and this condition is satisfied since C9's position is reversed only after C15 is engaged;

c) the signal as of (b) is applied from the downstream side of the N.O. load set in C9 to the upstream side of an N.O. set in C14, which means that C14 must be engaged for the further relaying of the signal — and this is satisfied since C14 is engaged so long as C2 is in its color-position and C15 is disengaged;

d) the signal as of (c) is applied from the downstream side of the N.O. set in C14 to the upstream side of an N.O. set in C12, which means that C10 must be engaged for the further relaying of the signal

— and this condition is satisfied by the fact that C12 is restored to its disengaged position once the latch-pawl of Drum #2 is brought to a given state of 'lift' by the approach block of Knob "A"

and,

e) the signal as of (d) is relayed from the downstream side of the N.C. load set in C12 to an N.O. load set in C11; which means that C11 must be in its engaged position for further relaying of the signal — and this condition is satisfied by the fact that C11 is sent into its engaged position by the 'drift' of Drum #2 past the 'departure' block of Knob "B" during the travel of Drum #2 towards its color-realigned position with Drum #1, and further C11 maintains its engaged position until the next black-and-white allowing alignment is signalled.

The signal as of (c) is then applied to C15 since the 'lift' of the latch-pawl by the approach block of Knob "A" imminently precedes the locking of Drum #2 into its color-alignment position with Drum #1, it follows that C15 is engaged only as color-alignment of the two drums is achieved or is imminently about to be achieved. By the refinement of the control circuit given on Page 115, it would follow that C15 would ~~also~~ engage to release position "B", disengage C14, and restore C9 and C7 to their disengaged positions, only after color-alignment of the two drums has been achieved.

This item (b) on Page 202 is explained!

TWO IMPORTANT CONSIDERATIONS:

Two important considerations underly the projected design of the Control Circuit. These are:-

a) the type of mechanically-held relay used

and b) the thinking behind the release of position "A" after black-and-white alignment has been achieved.

It has been repeatedly set forth above that one of the functions served by the use of mechanically-held relays was to eliminate chatter and electrical disturbances to the operation of the TV circuit when the functional demands on any given relay demands its continued engagement. This set of qualifications more or less defines the type of relay which is required. Explicitly, it would be required that:-

1) the holding of the relay in engaged position be accomplished either by a mechanical or a magnetic latch

and, 2) a second operating coil which overcomes the mechanical or magnetic latching action be a part of the relay.

Mechanical latches for the holding of relays in their engaged positions are extremely common, and, in fact, the name — mechanically held relays — is derived from the original use of such mechanical latches. More recently, it has been common to replace mechanical latches by permanent magnets which hold the relay-plunger once the plunger is drawn against the permanent magnet pole-face. This latter type of construction, which has been referred to as a magnetic latch, is preferred here, since strictly mechanical latches are subject to improper operation when the baseboards to which they are attached are jarred.

Finally as regards the mechanically-held relays used, it

should be observed that to secure the best operation of such a relay, the two operating coils of the relay — the one which acts to energize the relay and the other which acts to disengage or de-latch the relay — should be signalled from auxiliary contacts which are operated in common with the load contacts. The contacts which are available for the engaging action — the N.O. auxiliary contacts — should have a damping effect incorporated in them to assure the complete engagement of the engaging clutch against a spurious or chattering making action.

If the construction selected for the coupling permits, I will advise a set of relays suited in size and other characteristics to the original of the Control Circuit.

In the subject of the division to drawings Positions "A" after black-and-white alignment of the Drum has been achieved, it has been held that the inertia of the Drum Assembly and the Gear Motor Rotor, plus the friction forces between the gears constituting the power transmission, would be sufficient to hold any previously established position once the desired Drum Assembly alignment such positioning in front of the desired window has been achieved. It is further argument that a continued energizing of the Positive solenoid might lead to chattering and also to electrical disturbances to the T.V. circuits in normal operation. Held by one of two solutions:-

A. Either construct the friction elements along mechanically-held lines,

or

B. Hold any given Drum Assembly position on the basis of the inertia and friction forces named above.

The latter was chosen for the reason of its lower number in the former alternative.

(in continuation)

onto the departure block of Knob "B"; (b) a gliding of the latch-pawl down the slope of the departure block; and (c), in consequence of (b), a return of C5's actuator to its normal position.

With the return of C5's actuator to its normal position, a signal would be caused to resource from power-supply across the normally-closed set of contacts of C5, and then across a normally-open set of contacts in the still-engaged relay C9, to one of the normally-open sets of contacts of C14. A

C14, it will be recalled like C13, remains engaged so long as C2 is in the robot position and C15 is not engaged. Therefore, the signal originating at the normally-closed set of C5's contacts is relayed across the indicated normally-open set of contacts in the now-engaged C14 to pass across the normally-open set of load contacts in the now-engaged C12, and appear finally at the upstream-side of the normally-closed set of auxiliary contacts of C11. Here, the signal results in the engagement of C11.

The engagement of C11, by the closing of its normally-open load contacts opens a path for a succeeding signal from the normally-open set of contacts in C5 to be applied to the normally-open set of auxiliary contacts in C12. Thus when Drum #2, during the completion of the board which is initiated when C12 engages, causes the latch-pawl to mount the opposed block of Knob "A", the actuator of C5 is tripped, and a signal is caused to source from the downstream-side of the normally-open contacts of C5 across the normally-open set of load contacts in the still-engaged C7, and then across a normally-open set of load contacts in the still-engaged C9, to the upstream-side of one of the normally-open sets of contacts of the conventional relay C14. Since C14 is still engaged, this signal is then relayed across a normally-open set of load contacts in C11 to wend up ultimately at the upstream-side of the normally-open set of auxiliary contacts of C12. The application of the relayed signal to the mentioned set of auxiliary contacts causes an energizing of the disengagement motor of the spindle-coil of C12, and a resultant disengagement of C12. Accordingly, the power-signal to the drive-motor is interrupted, and, in consequence, the motor so disengaged [illegible] the latch-pawl mounts the slope of the opposed block of Knob "A". The engagement of the latch-pawl on Knob "A" accomplishes

then accomplished on the basis of the mechanical momentum of Drum #2

SENDING THE COLOR-VIENING-ALIGNED DRUMS INTO ACTION:-

Once the latch-pawl drops into Grab "A"'s slot, the actuator member of C5 returns to its normal position, and, with C12 in its now-disengaged position and C11 in its engaged position, a path is opened for a signal from the downstream side of the normally-closed set of contacts of C5 to the operating coil normally-closed set of auxiliary contacts of the mechanically-held relay C15. The application of the mentioned signal to the normally-closed set of auxiliary contacts of C15 leads to the engagement of C15. The signal which accomplishes this task proceeds from the downstream side of the normally-closed contacts of C5 across a set of normally-open contacts in the still-engaged relay C9 to the upstream side of a normally-open set of contacts in the conventional relay C14. From this point, it travels across the mentioned set of contacts in the still-engaged C14 to a normally-closed set of contacts in the now-disengaged mechanically-held relay C12, from which point it is relayed to a normally-open set of load contacts in the still-engaged C11. The still-engaged C11 permits the mentioned normally-open set of load contacts to convey the thus-relayed signal to the upstream-side of the normally-open set of auxiliary contacts of the mechanically-held relay C15. As indicated above, the eventual travel of the signal to the normally-closed set of auxiliary contacts of C15 leads to the energizing of the engaging section of the operating coil of C15, and leads to the engagement of C15.

For its part, the thus-accomplished engagement of the mechanically-held relay C15 leads to:-

a) the application of a maintained and continuous energizing signal to the Drive Motor

b) the discontinuation of phase supply to the solenoid of Positioner "B" and the conventional relay C14.

c) the sending out of a "disconnect signal" to C9 and C7

The discontinuation of phase supply to the solenoid of Positioner "B" and the conventional relay C14 according to (b) above takes place via the opening of the normally-closed set of load contacts in C15 when C15 is disengaged. The discontinuation of phase supply to C13, the solenoid member of Positioner "B", means the retraction of the plunger-member of Positioner "B" from the drill-hole member of Stud "B". The retraction of the plunger-member (see Dwg. #9) takes place under the action of the recoil spring member of the Positioner assembly. The retraction of the plunger-member of Positioner "B" from the drill-hole member of Stud "B" clears the impediment to the Drum Assembly's going into action which the energized Positioner constitutes. The simultaneous discontinuation of phase supply to ~~Positioner "B"~~ the conventional relay C14 means the de-energizing of C14, and the breaking of the paths whereby the 'activating' signals for C11 and C12 had transmitted.

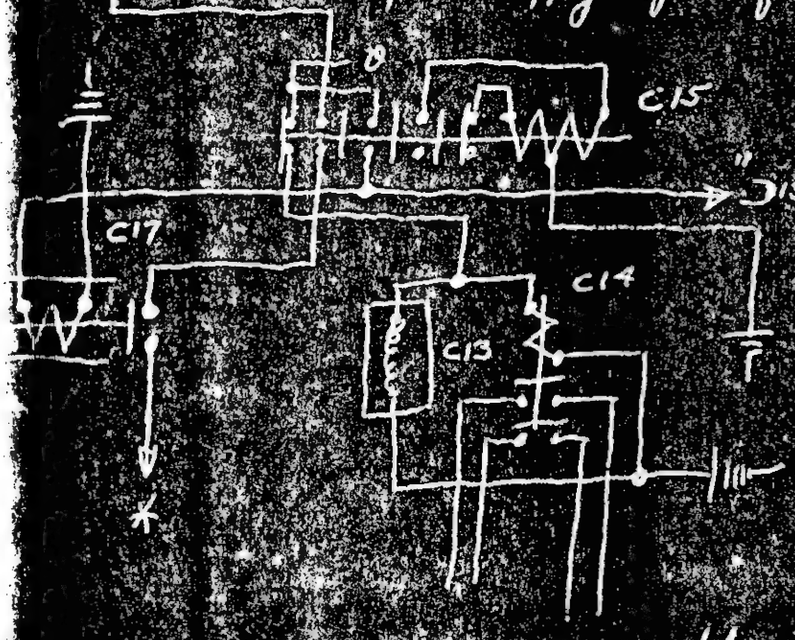
The application of a maintained and continuous energizing signal to the Drive Motor according to Item (a) above is accomplished by the 'making', or closing, of a normally open set of load contacts in C15 when C15 engages. The noted above, since the plunger-member of Positioner "B" is withdrawn from the drill-hole member of Stud "B" simultaneously with the application of the energizing signal to the Drive Motor, both conditions for the sending of the Drum Assembly into action are accomplished with the engagement of C15:-

1. the plunger-member of Positioner "B" as a holding agency against rotation of the Drum Assembly is removed

and

2. the power supply for the Drive Motor, which is required for its operation in color-viewing is supplied.

NOTE:- The simultaneity of action which C15 establishes between the retraction of the plunger of C13 and the energizing of the Drive Motor raises the question as to whether or not clearance of the recoil action of plunger assembly would not result in a jamming of the plunger in the drill-hole of Grab "B" and a possible consequent stalling of the motor. To forestall such an eventuality, it might be best to place a time-delay relay in the path of the motor-power supply signal from C15. Thus, in the set-up



shown below, the on-delay timing relay C17 would delay the application of the energizing signal to the Drive Motor for a sufficient period of time to guarantee the retraction of Positioner "B"'s plunger from the drill-hole of Grab "B".

thereby eliminating the possibility of jamming of the plunger or stalling of the motor.

Now, let us return to Item (c) above, namely the 'disconnect' signal to C7 and C9. [NOTE:- Observe that in the sketch given above a 'tap' off the signal to C7 and C9 is used to activate the so-called timing relay C17]. By its very nature, the 'disconnect' signal to C7 and C9 is a clear-the-board signal which readies the "black-and-white alignment" section of the control circuit for its next call to action. This 'disconnect' or 'clear-the-board' signal is accomplished via the closing of a normally-open set of load contacts on C15 when C15 is engaged.

In connection with the 'clear-the-board' signal from C15 to C7 and C9, it might be well to point out that a 'clear-the-board' signal for the case of the mechanically-held relay C16 is provided via a 'tap' from the color-position contact of the 2-position selector switch C2. Thus when the 2-position selector switch C2 is turned to its color-position, C16 is 'cleared' for the next service in the functioning of the "black-and-white alignment" section of the control circuit. No activation of any portion of the "black-and-white alignment" section of the control circuit follows from this since the turning of the selector switch C2 to its color-position performs removes phase supply from the "black-and-white alignment" section of the circuit.

Finally, it should be observed that the 'clear-the-board' signal for the "color-alignment" section of the circuit [in particular for the C15 and C11 components thereof] is obtained by a 'tap' from the black-and-white position of the 2-position selector switch C2. Thus, simultaneously with the next calling of the 'black-and-white' alignment section of the circuit into action,

the color-alignment section of the control circuit is readied for its next call to duty

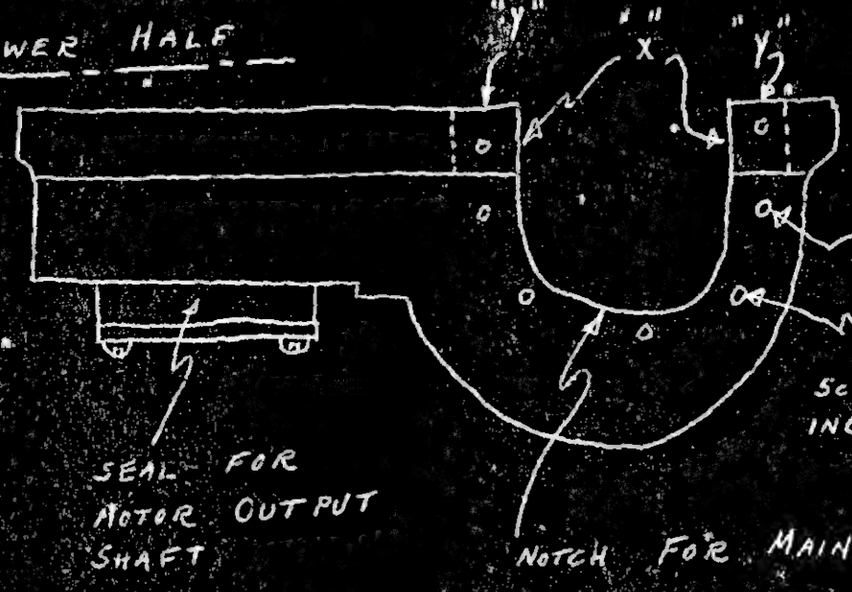
DWG. #8

1. 3/4" x 3/4" x 1/16" aluminum angle ring — (choose 16. "JB")
2. See Item "JB"
3. " " "
4. Anchor gussets for the "support members" as per Dwg. #1
X. (See Items "JD", both views)
5. 3/4" x 3/4" x 1/8" aluminum angle spokes — (also see Items "JB" and "JC")
6. New 1600 series 1 13/16" shaft-size double-sealed single row ball bearing
7. 1/16" ℄ aluminum coverplate
8. 1/8" ⌀ x 3/8" lg. rd. hd. machine screws - 6 req.
9. " aluminum hub member (machine from solid round or tube stock)
10. 1/8" ⌀ x 1 1/4" lg. capscrew and bolt - 2 req. (See Item "JD" - Plan View)
11. mild steel support axle
12. 1/8" ℄ aluminum anchor gussets welded as shown to the rim — 6 equi-spaced sets req.
13. shank of support axle — see Dwg #1 for members completing the "support"
14. hole for cotter pin
15. 1 1/4" x 1 1/4" x 1/16" aluminum angle rim of Outer Drum L.H. End-Ring
16. hole for the entry of Positioner "B" & plunger into Knob "B"; hole is to be 1/2" ⌀ at its innermost and smallest point with the peripheral metal being bevelled off as indicated to give a larger "target" for the plunger
17. departure Hook member of Knob "B"
18. filler steel [NOTE:- for the immediate region of the hole members

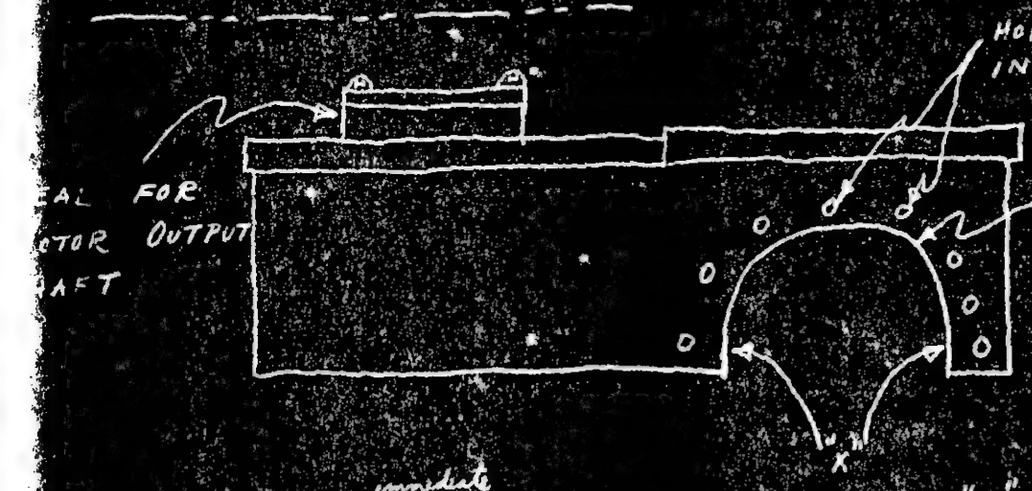
the filter slat is to be notched to permit the plunger a certain latitude in going "home" without incurring the risk of mechanical injury to the slat. The dotted-line extension of the filter slat as indicated in this detail shows the extent to which said slat covers the End-Ring for the balance of the Ring. For the indicated portion of the Ring, the dotted-line therefore shows the extent to which notching of the slat is projected. In the circumferential direction (first direction), a $\frac{1}{2}$" distance between the hole perimeter and the nearest portion of the notched slat is proposed.

19. The members labelled (19), when connected by brazing or welding as indicated, will form the "top portion" or "top half" of the Gear Housing. (NOTE:- The Gear Housing is composed of two halves:- an "upper half" into which the members marked (19) enter; and, a "lower half" into which the members marked (25) enter. The "lower-half" is flared, as indicated in the Section Elevation View, to form a "female" at its top rim; while the bottom rim of the "upper-half" forms the "male" member of the joint. The joint should be friction-tight at all points; it should be caulked or felt-lined to achieve a reasonable degree of tightness. Both halves should be notched to permit their sliding over (27), the main drive shaft of the assembly. The so-notched sections, with the principal portions of the notches following the contours of (27), would, when assembled, form 4 round openings about (27) with a minimum clearance from (27). These openings are then sealed by 4 "thick" felt seals (31) pressed "home" against both halves by retainer rings (30). In Side Elevation View, the halves would then appear as indicated approximately below:-

THE LOWER HALF



THE UPPER HALF:-



NOTE:- The immediate portions of the notches to which "x" points is in each case a straight line tangent to the circle described by the balance of each of the notches.

"y", in the case of the lower half, indicates regions in which the flash is eliminated to accomodate the members (30) and (31), and enable effective sealing.

Both halves of the Housing to be made of 24 gage sheet steel galvanized.

Dwg. #8

20. Mild Steel Coverplate
21. Drive Motor Output Shaft
22. $\frac{1}{16}$" ø x $\frac{3}{16}$" lg. rd. hd. mach. screws – 6 req.
23. $\frac{1}{16}$" thk. felt rings, 4 per seal, compressed to form $\frac{3}{16}$" thick seal
24. 18 gage sheet steel legs for housing — size and shape to convenience
25. The members labelled (25) taken together form the 'lower-half of the Housing. See (19)
26. Driven Gear member of Helical Gear Train
27. Main Drive Shaft ($1\frac{3}{16}$" ø at the seal points)
28. Constantly-Maintained Oil Level
29. $\frac{1}{16}$" ø x $\frac{1}{4}$" lg. rd. hd. mach. screws (12 per retainer ring), to screw into snugly-fitting holes in Housing wall
30. $1\frac{5}{8}$" O.D. x $1\frac{3}{4}$" I.D. x $\frac{1}{16}$" thk mild steel retainer rings containing 12 equi-spaced holes drilled and tapped on a $1\frac{7}{16}$" ø bolt circle
31. 2 – $\frac{1}{16}$" thk. felt rings $1\frac{5}{8}$" I.D. x $1\frac{5}{8}$" O.D. superimposed on one another to form a $\frac{1}{8}$" thk felt seal
32. $\frac{1}{8}$" x $\frac{1}{8}$" x $\frac{3}{8}$" lg. steel key between the Main Drive Shaft and the driven gear
33. The driving gear

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 8/27/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained John D. Walker

Address Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

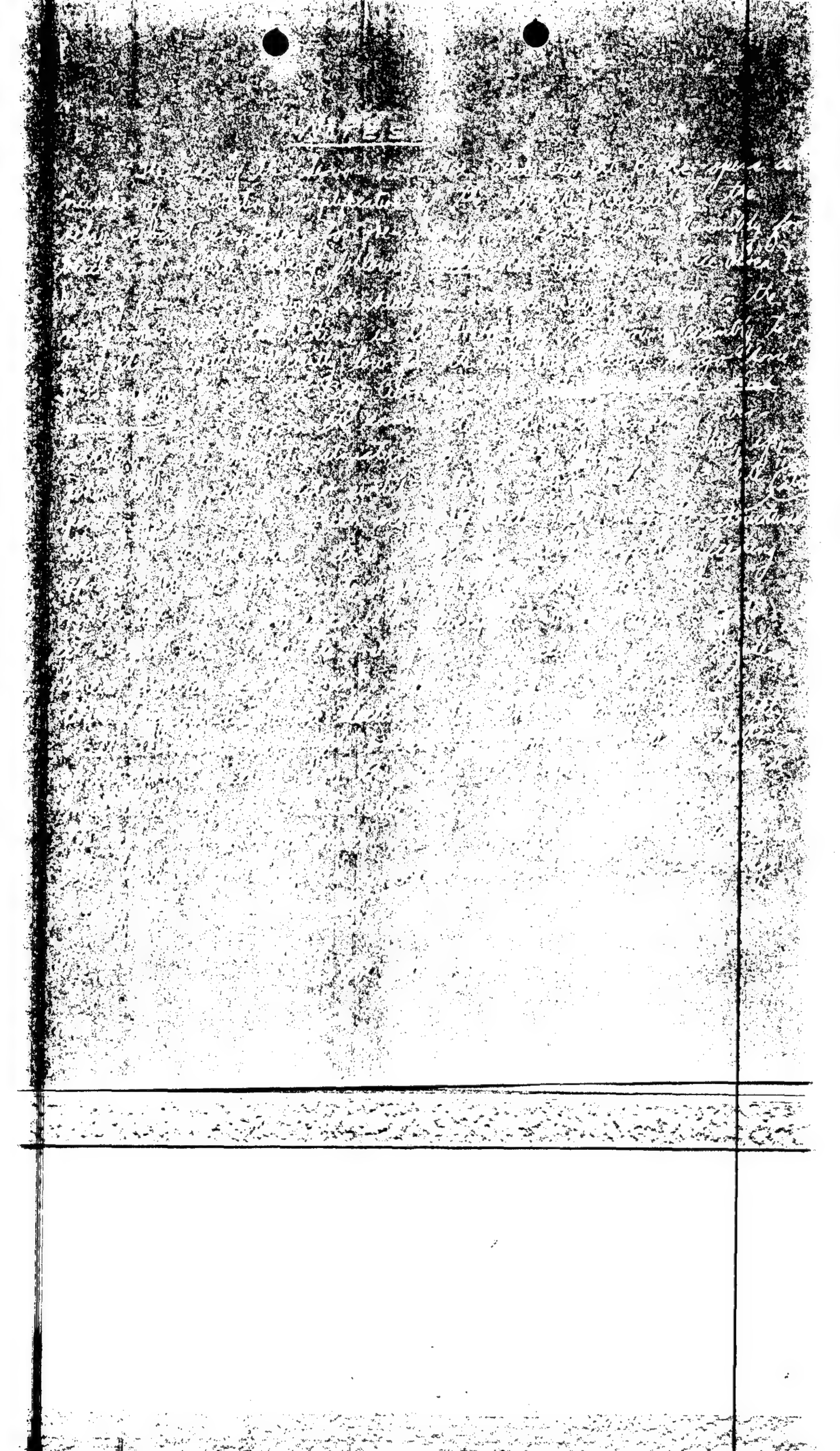
Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

146. Photostatic copy of papers entitled "Notes".

80A
100-95068-1B



Servo Motor Arrangements

The C.B.S. System:-

The system employed by C.B.S. to maintain synchronization of the color disc is noted. The output signal from a magnetic structure which rotates in accordance with the color wheel against the vertical P-P pickup (the motor receiver). The resulting operation which takes place in the phase discriminator (discriminator or comparator) section of a servo-mechanism capable of the application of the out-of-balance voltage or [illegible] of the discriminator is applied to the grid of a [illegible] reactor, and the saturable reactor in turn controls the voltage applied to the induction motor driving the color wheel. The servo-mechanism, conventional in its [illegible] consists of its details of design, like all servo-mechanisms of a discriminator section, b) an anti-hunt [illegible] for the stability of the servo itself against undue [illegible] a certain [illegible] c) a power output or control [illegible] coupled through the out-of-balance output [illegible] for instance a [illegible] of control mechanism [illegible] balance [illegible] magnetic structure which [illegible] or electrical circuit developed the output [illegible] resulting from the periodic [illegible] a suitable magnet, with [illegible] portion of [illegible] coupled to [illegible] must also be [illegible] way reduction [illegible] fundamentally the [illegible] commutator

of an induction motor at any given output torque and applied voltage.

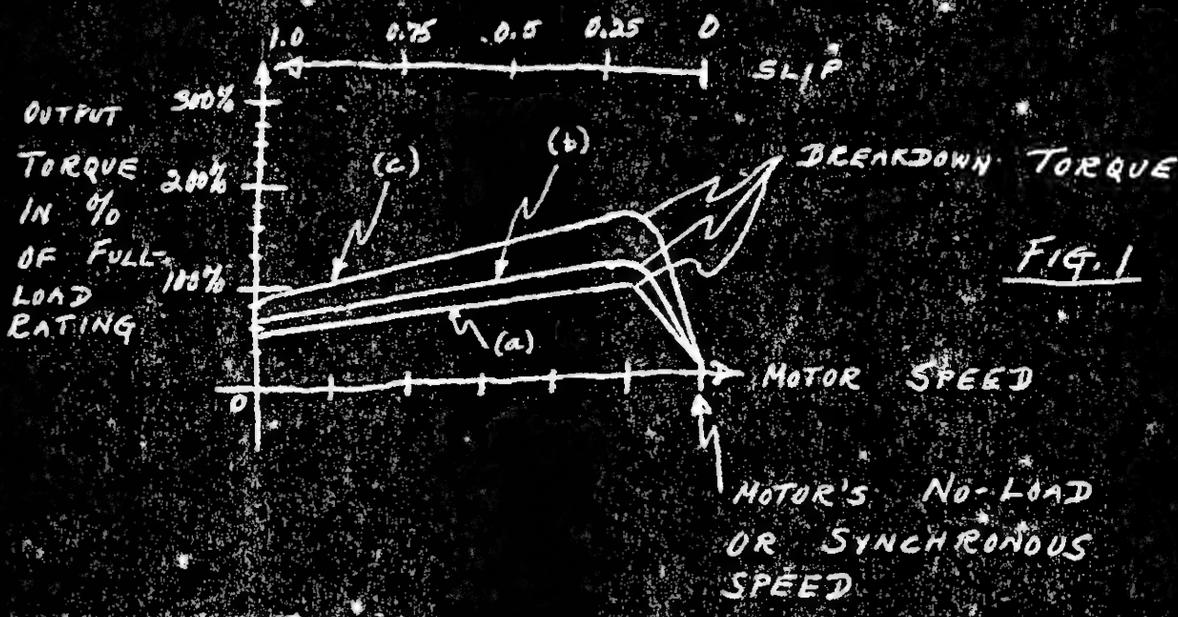


FIG. 1

Fig. 1 will illustrate the thought projected immediately above. Curves (a), (b), and (c) indicate generally the speed-torque (and/or torque-slip) relationships for a polyphase induction motor under (a) solely for the lowest of three slightly fixed applied voltages, (b) for an intermediate voltage, and (c) for the highest of the motor's suitably wide range of its designed task. The only that portion of each curve which lies between the full-load speed and the no-load speed of the motor is of interest. [NOTE:- The full-load speed of the motor is that speed ~~which corresponds to the~~ point nearest the no-load speed at which the output-torque of the motor most efficiently approximates the theoretical torque at the given input (given voltage) condition. Roughly speaking, this means that only that portion of each curve which lies to the right of the intercept of the breakdown torque with the motor speed axis is of interest.] In each of the cases of Curves (a), (b), and (c), it is clear that, in the indicated region of interest, the motor's speed is a highly defined function of the output torque of the motor.

that for any given applied voltage, the motor will operate at
only one speed as determined by the torque output
to be used on the shaft.

If we took time to draw a vertical line from any given
speed figure between the motor's full-load speed and its no-load
speed, we would find this vertical line would intercept each of curves
(a), (b), and (c), but we also see that to obtain the arbitrarily
chosen speed, it would be necessary to do either of two things:-

(a) we might adjust the input conditions to the motor
(the applied voltage to the motor) to obtain some
speed vs. torque curve on which the required torque
corresponds to the chosen speed.

or

(b) we might adjust the driven member so that at any
arbitrarily chosen input condition to the motor, the
required torque output corresponds to the desired
constant speed.

In short, the problem in driving the rotor shaft or the color
drum portion of a CBS color recording unit is to establish
and hold a given constant speed to a high level of accuracy
and stability. The induction motor lends itself to such a
service, to constant speed service, if the input conditions to the
motor are matched to the required output torque; -- or
if the required output torque is closely regulated to a fixed
input condition. CBS in its system chooses the former of
the two possible alternatives, and establishes the required constant
speed by adjusting the input conditions to the motor in such a
fashion that the required output torque vs. speed curve is achieved.

In doing this, it employs a servo-mechanism operating a saturable reactor as the means of adjusting the input conditions (the voltage applied) to the motor.

"SOME POSSIBLE NON-SERVO MECHANISMS":-

In this class, some (6) alternatives have been offered:-

A. a system which provides for the feeding of a 48-cycle A.C. current to a 60-cycle, 4-pole, (1800 rpm) synchronous motor as a means of obtaining a (constant) output speed which is $\frac{48}{60}$ of 1800 (i.e. 1440 rpm);

B. a system which provides for the feeding of a 144-cycle A.C. current to a 60-cycle, 12-pole (600 rpm) synchronous motor as a means of a constant output speed which is $\frac{144}{60}$ of 600 (i.e. 1440 rpm);

C. a system which provides for the feeding of a 60-cycle A.C. current to a 60-cycle, 4-pole (1800 rpm) synchronous motor as a means of obtaining a constant 1800 rpm output which is then geared "down" mechanically to 1440 rpm;

D. a system as per (A) except that the 48-cycle rotor pulse forms the base of the 48-cycle A.C. generating system;

E. a system as per any of (A), (B), (C), or (D) as regards the A.C. fed to a synchronous motor

(of the set)

(A) ...ed the required 48-cycle A.C. is obtained by a 2-step conversion from the 144-cycle vertical pulse ... a multi-vibrator and amplifier ... the components of the 2-step conversion system

(B) ...ere the required 144-cycle A.C. is obtained by a 1-step conversion from the 144-cycle vertical pulse of the set. An amplifier constitutes the 1-step conversion system

(C) ...re the required 60-cycle A.C. is obtained by a 3-step conversion from the 144-cycle vertical pulse of the set. Two multi-vibrator circuits and a ... amplifier section form the conversion system

but in which the synchronous motor is part of a tandem arrangement with an induc motor, with the synchronous motor supplying a part of the start and run energy requirem

and,

F. a system as per (A), (B), (C), or (D) as regard generating of an A.C. feed to a synchronous mo as per (E) as regards a tandem arrangement an induction motor but in which the two motor built into a common frame.

Each of the systems listed above have the following in comm (a) they propose a "lock" to a powerful and accurate sig [the 144-cycle vertical pulse in (A), (B) and (C), and the 48-c color pulse in (D)] and, in fact, a signal which gates picture-projection of the set; and, (b) they lodge the pha detection or discrimination functions of the CBS servo-mec in the functional properties of a synchronous motor.

THE NOW-PROJECTED IDEA:-

The now-projected idea goes back to the use of an indu for the Driver for a color-wheel or color-drum. already been indicated [Pages (2) and (3), — in particular (3)] an induction [illegible] to constant speed service of either [illegible] imposed. The above line goes to [illegible] listed under Item (b) on Page (3).

It is suggested that as a [illegible] condition, the mo is selected to drive a given color wheel or color drum [illegible] for the normal and usual design procedure, 10-25% [illegible] and that therefore its overall speed at standa [illegible] would lie somewhere between its full-load or [illegible] no-load speed. The condition would be ins

but in which the synchronous motor works as part of a tandem arrangement with an induction motor, with the synchronous motor supplying only a part of the start and run energy requirements; and,

F. a system as per (A), (B), (C), or (D) as regards the generating of an A.C. feed to a synchronous motor and as per (E) as regards a tandem arrangement with an induction motor but in which the two motors are built into a common frame.

Each of the systems listed above have the following in common:- (a) they propose a "lock" to a powerful and accurate signal [the 144-cycle vertical pulse in (A), (B) and (C), and the 48-cycle color pulse in (D)] and, in fact, a signal which gates the picture-projection of the set; and, (b) they lodge the phase detection or discrimination functions of the CBS servo-mechanism in the functional properties of a synchronous motor.

THE "NEW" PROJECTED IDEA:-

The above projected idea goes back to the use of an induction type motor as the power for a color-wheel or color-drum. It has already been indicated [Pages (2) and (3), — in particular (3)] that an induction motor lends itself to constant speed service if either of two conditions be imposed. We shall now go to that alternative listed as item (b) on Page (3).

We propose that as a primary condition, the motor that is selected to drive a given color wheel or color drum is, as far as practical and usual design procedures will allow, 10-25% "over-large", and that, therefore, its operating speed at standard supply voltage would lie somewhat between its full-load speed and its no-load speed. This condition would be indicated by

Fig 2:-

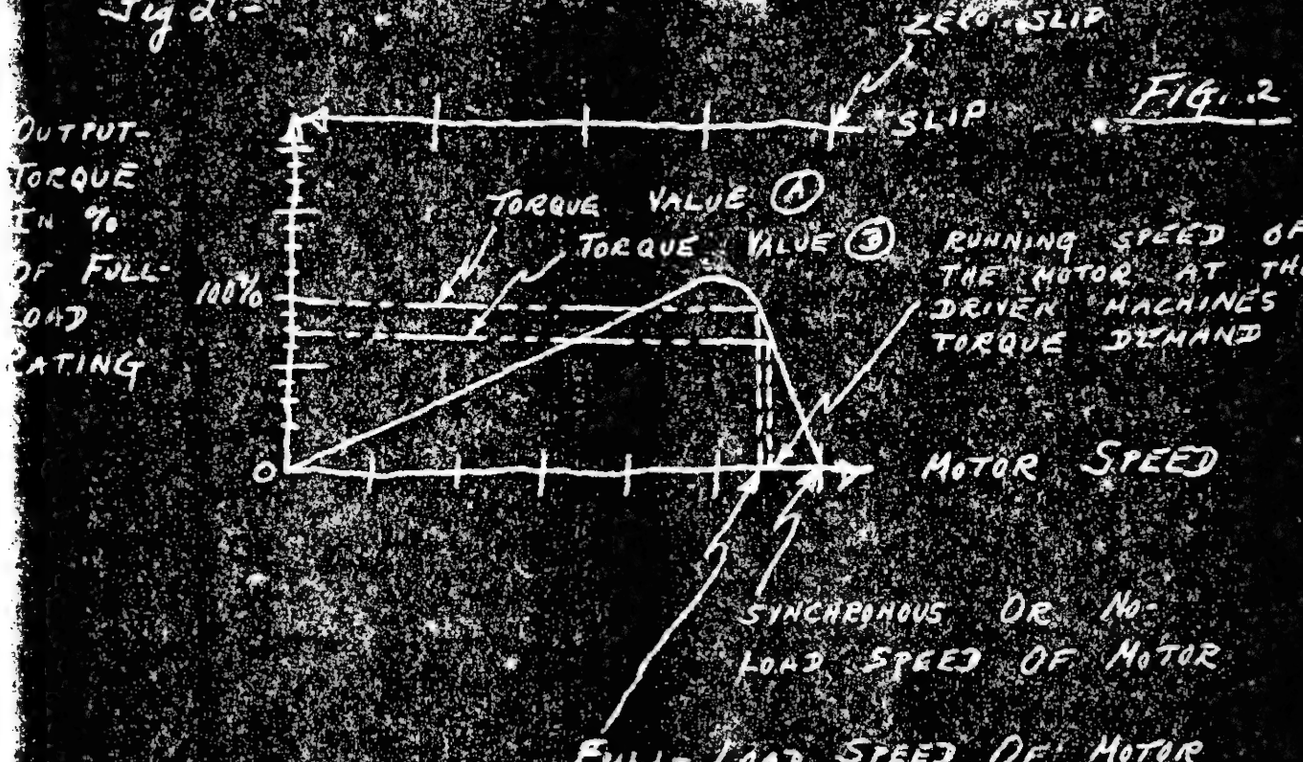


FIG. 2

where the running speed of the motor and the machine would lie between the full-load speed of the motor and the motor's no-load or synchronous speed. If we suppose that the full-load speed of the motor is 1725 rpm and the no-load speed is 1800 rpm, and, finally, let us suppose that the torque-demand of the driven rotor-wheel or rotor-drum within the equilibrium speed range is such that a speed of 1750 is obtained from the motor. Now a gear ratio between the motor shaft and the wheel or drum-shaft of 50:60, this would mean a running speed of approximately 1458 rpm for the wheel or drum. To bring the wheel or drum to a constant speed of 1440 rpm thru the indicated gear set would demand a motor speed of approximately 1729 rpm. To accomplish this with the conditions stated above, to reduce the motor's speed from 1750 rpm to 1729 rpm, would require, by Fig 2, that the torque-demand on the motor be lifted from Torque Value (B) to a value very close to Torque Value (A). This task, which amounts to supplementing the driven device's torque-

element by an increment in torque that when added to Torque Value (B) would approximate Torque Value (A), the newly-projected idea purposes be accomplished with an Eddy Current Brake which is controlled by a servo-mechanism linkage.

Before continuing with a description of the newly-projected idea, let us examine, at least superficially, what is involved. If 1725 rpm is the full-load speed of the motor involved and its nominal horsepower rating were $\frac{1}{8}$ HP (0.125 HP), then the full load torque-output of the motor would be:-

$$\frac{0.125(63025)}{1725} = 4.57 \text{ in-lbs.}$$

If the motor were assumed as 95% average and if the loaded speed without external influences were 1750 rpm as indicated above, then

$$\frac{(1-0.25)(0.125)(63025)}{1750} = 3.37 \text{ in-lbs.}$$

would be the output torque at the above-indicated condition of loading, and

$$4.57 - 3.37 = 1.2 \text{ in-lbs.}$$

would have to be the torque increment borne by the Eddy Current Brake Assembly. Assuming that the braking action would occur at a radius of 12" from the axis of rotation, then

$$\frac{1.2}{12} = 0.1 \#$$

would have to be the force exerted by the Brake at the indicated radius.

Consider then an arrangement as per Fig. #3 in which a drum (of aluminum), attached to the color-wheel or color-drum, is made to pass thru a magnetic structure of the type indicated in Fig. #3:-

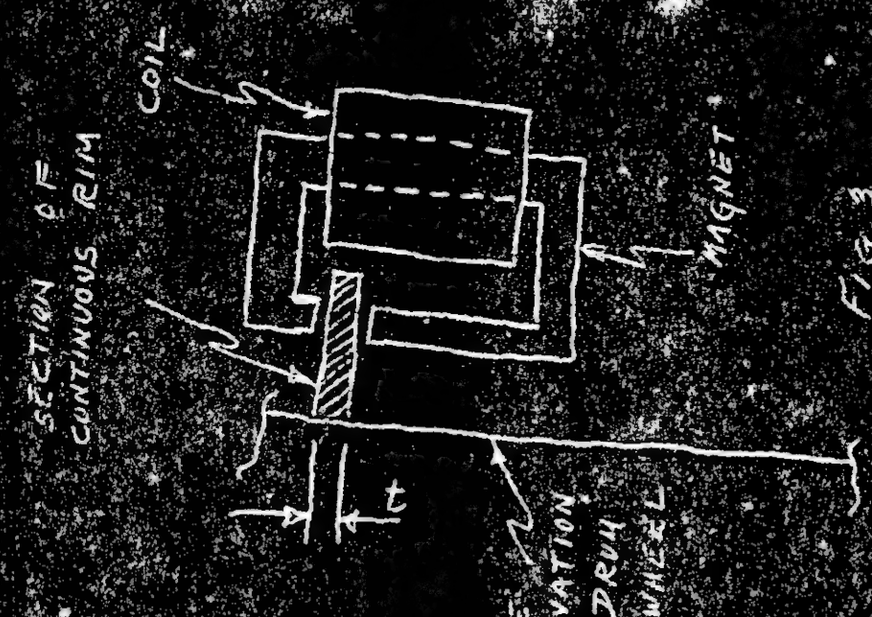


FIG 3

Let the pole face be square, and let the average path of the induced currents be assumed to be $4l$; where (l) is the length of any side of the pole face. The magnitude of the induced E.M.F. in a circuit in which a conductor of length (l), cuts magnetic flux of density B at a velocity of (V) is given by:-

$$E = BlV \times 10^{-8} \qquad (1)$$

where (E) is in volts, (l) is in cms., and (V) is in cms. per sec. If the resistivity of the conductor is given by (ρ), then

$$R = \frac{4\rho l}{tk} = \frac{4\rho}{t} \qquad (2)$$

would define the resistance in ohms to the induced currents where:- (ρ) is in $\frac{\text{ohm}}{\text{cm.}}$, $4l$ = the average current path in (cms.), and the product of (t) - in cms - and (k), also in cms, defines (A), the area of the conductor. From (1) and (2), it follows that I, in amps, would be given by:-

$$I = \frac{E}{R} = \frac{BlV \times 10^{-8}}{\frac{4\rho}{t}} = \frac{BlV(10^{-8})t}{4\rho} \qquad (3)$$

The force acting on a conductor in a magnetic field for the above-indicated construction is given by:-

$$F = \frac{B I \ell}{10} \qquad (4)$$

where:- (F), in dynes, is the mentioned force; (I), in amps, is the current flow in the conductor; and (ℓ), in cms, is the length of the conductor. Now, by (3) and (4), we obtain

$$F = \frac{B\ell}{10} \cdot \frac{B \ell V (10^{-9}) t}{4\rho} = \frac{B^2 \ell^2 V (10^{-9}) t}{4\rho} \qquad (5)$$

Converting (F), which in (5) is yielded in dynes, to units of gms., since

$$980 \text{ dynes} = 1 \text{ gm},$$

then

$$(F)_g = \frac{B^2 \ell^2 V (10^{-9}) t}{4\rho\,(980)} = \frac{B^2 \ell^2 V (10^{-11}) t}{39.2\,\rho} \qquad (6)$$

For a speed of 1440 rpm (24 rps) and a radius of 12", (V) would have a value of

$$V = 2\pi (24)(12)(2.5) = 4530 \text{ cms/sec.}$$

and (6) may be written

$$F_g = \frac{45.3\, B^2 \ell^2 t (10^{-9})}{39.2\,\rho} = \frac{1155\, B^2 \ell^2 t (10^{-9})}{\rho}$$

Taking

$B = 750$ gauss

$\ell = 1$ cm

$t = 0.2$ cm

$\rho = 1.724 (10^{-6})$ ohm-cms

we find that

$$F_g = \frac{1155 (750^2)(1)(0.2)(10^{-9})(1.15^2)}{1.724 (10^{-6})} = 40.3 \text{ gms.}$$

$$= \frac{40.3}{454} = 0.0886\ \#$$

If we were to use two such magnetic structures as have been indicated above, thus giving the arrangement a wide latitude of operation about the required 0.1# force calculated on Page 7, then a braking force of

$$2(0.0886) = 0.1772\ \#$$

would be available. By definition

$$\Phi = \mathcal{B}A \qquad (7)$$

and since $A = l^2 = 1\ cm.^2$, then $\mathcal{B} = \Phi$. The required magnetomotive force is given by:-

$$\Phi = \frac{mmf}{\mathcal{R}} \qquad (8)$$

where $\mathcal{R}$ = the reluctance of the magnetic path, and is, in turn, given by

$$\mathcal{R} = \frac{l_1}{\mu A} \qquad (9)$$

where:- l_1 = the length of the magnetic path; μ = the permeability of the path; and, A = the area of the flux path. Letting $l_1 = 0.3\ cm$, $\mu = 1$ and since $A = 1\ cm.^2$,

$$\mathcal{R} = \frac{0.3}{(1)(1)} = 0.3\ \text{reluctance units}$$

By (8) then, since

$$mmf = \frac{4\pi NI}{10}, \qquad (10)$$

then

$$750 = \frac{(.4\pi)NI}{0.3}$$

$$NI = \frac{750\,(0.3)}{0.4\pi} = 179\ \text{amp-turns}$$

If (I) is to be not more than 0.005 amps as an average condition,

$$\frac{179}{0.005} = 35{,}800\ \text{turns/coil}$$

would be required.

Assume the use of 2 oz. #36 gage wire. The cir. mils of #36 gage wire = 0.00

Then

$$= 35{,}800\,(25) = 895{,}000 \text{ cir. mils} = 0.895 \text{ in.}^2$$

would have to be the x-sectional area of the winding on any one side of the square pole section. For "x" = 1", then

Fig. 1

$$l_2 = \frac{0.895}{\frac{1}{2}} = 1.790"$$

Since any side of the pole is 1 cir. = 0.45", the minimum length of any winding-turn would be 1.8", while 5.6" per turn would be the maximum length.

This would mean an average length of 3.6" per turn; or a wire-length of

$$\frac{35{,}800 \cdot (3.6)}{12} = 10{,}720 \text{ ft. per coil}$$

Since the resistance of 36 gage wire is approximately 450 ohms/1000 ft.,

Then

$$\frac{10{,}720}{1000} \times 450 = 4830 \text{ ohms}$$

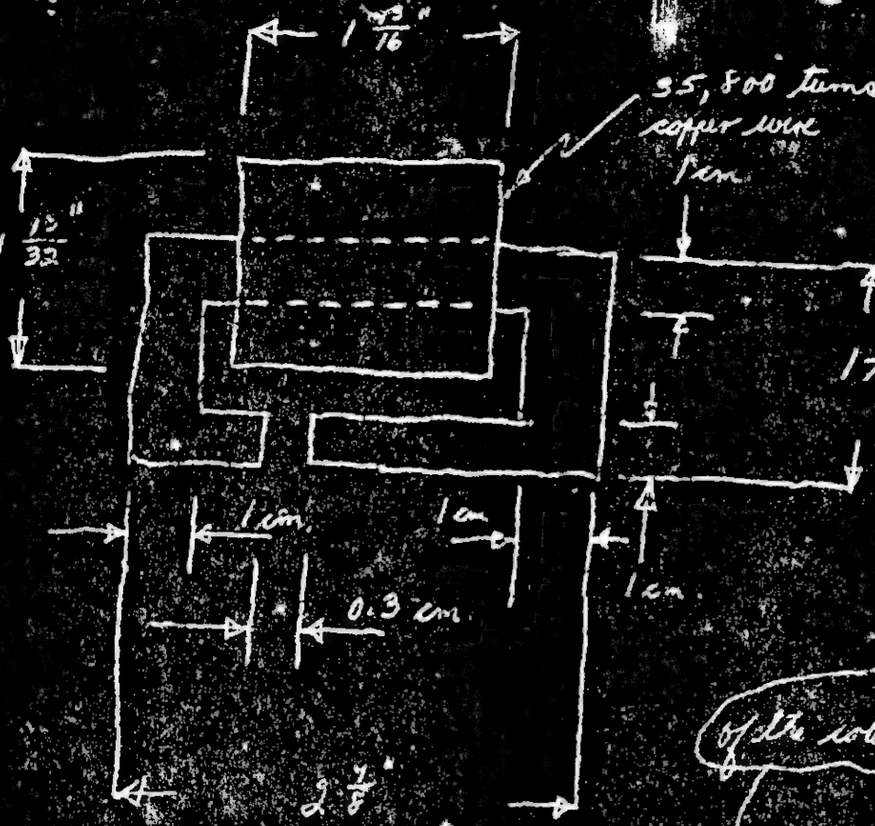
would be the resistance per coil. Two coils in series, as stated above would mean a total resistance of

$$2\,(4830) = 9660 \text{ ohms}$$

The feeding of 5 milliamps against a resistance of roughly 10,000 ohms is a test which lies comfortably within the range of a 6SN7 vacuum tube.

By the above approximations, it will be seen that:-

a two ~~coil~~ magnetic structure as per the sketch given below:-



of the rotor-wheel or drum

placed opposite another (to establish balance around the axes of rotation) ~~operate~~ fed by a tube of the class indicated above

and

b. a servo-mechanism based on a phase detector or discrimination section comparing the pulse frequency from a slug-alternator-and-pulse magnet arrangement with the vertical r-f pulse of the set, in which the out-of-balance or error voltage from the phase detection circuit is used to bias the operation of the tube feeding the brake magnets

would provide a system, which properly stabilized by anti-hunt provisions that, in conjunction with an aluminum rim of c. 2 cm thickness attached to the wheel or drum, would yield accurate control over an induction motor towards obtaining constant (and controlled) speed service from the motor.

Thus a servo-mechanism for the control of an induction motor (single-phase - or even 2-phase) has been outlined. It now remains to suggest the merits of one system

with respect to another.

CRITIQUE OF THE DESCRIBED SYSTEMS

For obvious reasons, it would be best to treat each of the systems on their individual merits, and then to treat with their comparative merits.

The CBS synchronizing method has as its strongest advocate the fact that it employs a type of motor, an induction motor, which will permit of a wide latitude in translation as the screen sizes built go upward. As the industry moves towards larger screen color viewing sets, CBS will be able to use its system almost intact, except for increasing the motor ratings involved. The larger motors which will become involved will call for a comparatively moderate increase in the cost of the synchronization systems they employ. As a rule, induction motors are less expensive, more rugged, and smaller than corresponding speed synchronous motors. Still other important factors from many points of view. There can no doubt that the "lightness" of CBS system's arrangement would be something less than one could obtain from the best kind of a design of a separately energized motor driven, but a stable and accurate servo solution is preferable at a lower production cost.

The systems described heretofore under the headings of "SOME POSSIBLE NON-SERVO MECHANISMS" require some additional comment, after their common properties are discussed. In practice each of systems from (A) thru (F) rejects the use of one of the most powerful and accurate operating agencies has a sampling system standard to gain the performance of an externally powered motor. Are smaller than systems and could suffice as point to be used the performance of a motor-power-operating section of the mechanism and underlying principle is readily addressed to in the case of (D), and possibly thus regarding the cases of (E) (F).

The principle of employing adding a motor-power-generating section to the set and controlling the characteristics of the generated power by "locking" the motor-power-generating section to one of the set's powerful and accurate signals commits one to the idea of synchronous type motors, for these are the only type of motor that can exploit the aforementioned "lock". There can be no doubting of the control which the "lock" exerts over the performance of the motor-power-generating section of the set; but [illegible] reason exists for believing that only a fairly special type of synchronous motor can avoid attributing a certain looseness to the system as a whole. Ordinary construction synchronous motors do "hunt" and oscillate about their nominal "absolutely" constant speeds. For most synchronous motor services, the mentioned "hunting" or oscillation is a negligible item, for the service tolerances are sufficiently wide to take this into account. In the "NON-SERVO MECHANISMS" which these motors serve, they, as noted above, must incorporate within themselves the phase detection and anti-hunt functions which are otherwise taken care of in the CBS synchronization system. Hence, the synchronous motors which must be used here must be of a construction that limits the "hunting" and oscillating tendencies to a negligible limit. Given such a specially constructed synchronous motor (which means that, if one were to use a motor which approximates the stability which the "locked" motor-power-generating section would have), there could be no questioning of the stability which such an arrangement would have.

Finally, we are brought to the system projected under the heading of the "THE NEW-PROJECTED IDEA". It has already been indicated that the "NEW-PROJECTED IDEA" amounts to a complete reversing of the fundamental concept behind the CBS servo. Whereas CBS delivers constant speed servos by a control exerted over the input conditions to the motor, the "NEW-PROJECTED IDEA", which will hereafter be referred to as the Eddy Current Brake

Principle, electrically achieve stable constant speed service by co
the motor's work-output. The fact that the Eddy Current
Principle uses an induction motor means that every Eddy-Cur
asset that was previously attributed to the CBS servo-system
it employs an induction type motor, must also be attributed
new-proposed system. The other advantages which the new-pro
system make available will come out in the comparisons and
statements listed below:-

For quite clear reasons, the comparisons noted below will
refer to the new-projected idea as a reference standard:-

Control over the input-conditions to the motor, which is CBS
technique for obtaining constant speed service from an induction mo
is achieved. Here a saturable reactor is a means of controlling
applied voltage. Saturable reactors are expensive equipment, and
the best of production conditions will require as for the iron of the
must answer to the very highest of standards for magnetic iron.* It
is the writer's belief that a saturable reactor of the type need
cost in the order of $20 each; and, further, it is anticipated that
little hope can be held for that to be produced at a selling price
than $5 each. By comparison, the Eddy magnets of the new-pro
idea would cost substantially less than $5.00 for both, a reas
good estimate being about $1.00 for the two magnets. A less important
factor arises in a comparison between the cost of a CSNTG (which
is used to "power" the magnets) and the cost of the GAMG (which
used to operate the saturable reactor). A difference in the cost
is involved here. A more important factor is the "time factor"
saturable reactor versus that of the magnetic structures which
been proposed here. A saturable reactor has a "time factor" of
$\frac{1}{20}$ sec, which is large in comparison to the phenomenon to which

* The optimum gain properties of a saturable reactor are critically
pendent on the quality of the iron used.

accomodation must be made, and is getting very much larger than one would obtain from the brake magnets.

Now, turning to a comparison between the "NON-SERVO MECHANISMS" and the now projected idea, the cost of a synchronous motor versus that of an induction motor forms the most obvious item of comparison. The cost of a 4-pole synchronous motor is substantially larger than that of a 4-pole induction motor; the cost of the 12-pole synchronous motor as is proposed in item (B) ["Further SOME POSSIBLE NON-SERVO MECHANISMS"] would be even larger. Going into the question of the motor power-generating systems which each of the proposals from (A) thru (F) involve, it is clear that here we have large items of additional expense which must be superimposed on the high cost of a synchronous motor of fairly special design. We note that the motor power-generating system would play a [illegible] in the overall cost of the whole [illegible] drive [illegible] equally pronounced as the age of drive motor [illegible] (which would happen when the industry moves toward [illegible] larger [illegible]). In this connection it should be recalled that the [illegible] of the C-BS synchro-[illegible] system is to be [illegible] without [illegible] larger [illegible] considered [illegible] advantages [illegible]. The factor which [illegible] motor [illegible] with the [illegible] accurate [illegible] signal [illegible] were [illegible] to [illegible] (D), but [illegible] (E) and (F) [illegible] (E) [illegible] [illegible] adopted [illegible] induction motor [illegible] arrangement [illegible] power-generating [illegible] larger [illegible]

Without further belaboring the point, it is then clear that in Schemes (A) thru (F), the translation of the basic motions to larger size drives would be costly because of the higher cost of synchronous motors as compared with induction motors, and because the necessary power-generating sections would have to increase with the size of drives involved [even when Schemes (E) and (F) are used].

Before leaving the topic of the "NON-SERVO" MECHANISMS it should be observed that as larger size screens are supplied for color-viewing, and as ~~large~~ especially as this begins to involve the use of drives rather than direct currents, the question of the size (the physical spatial dimensions) of the motor-forms will become increasingly important. As previously pointed out, synchronous motors are larger than induction motors of the same horsepower rating, and hence this factor would be aggravated by the use of synchronous motors.* And, lastly, it should be remembered that when Schemes (A) thru (F) involve multi-vibrator or counting circuits as component parts of the vertical pulse-to-generated A.C. motor-driving power-actuator, these are an additional cost item.

Returning to the question of the comparative merits of Schemes (A) thru (F) versus those of the now-projected idea, it will be recalled that it was said of the "NON-SERVO" MECHANISMS" that there would be no doubting of the "tightness" of the "lock" that would be established via the "NON-SERVO" MECHANISMS". This puts it up to any servo-mechanism, whether it be the c.e.f. servo or the eddy Current brake principle servo, to match the stability which

* When going into the question of motor-size, it should be noted in connection with Scheme (B) the frame size of a 12-pole motor would be larger that that of a corresponding horsepower 4-pole mo

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 9/20/51

ABRAHAM PROTHIAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained John D. Walker

Address Federal Detention Headquarters, NYC

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

147. Photostatic copy of Drawing #6 Revised.
148. Photostatic copy of Drawing #7 Revised.
149. Photostatic copy of Drawing #8 Revised.
150. Photostatic copy of Drawing #9 Revised.
151. Photostatic copy of Notes on Drawing #9.
152. Photostatic copy of Paper entitled "Errata, Addenda, and Comments".

81

100-95068-1B

2

Sit

Dwg. #6 CONTD

1. 1 3/4" x 3/4" x 3/16" angle steel shoe glued to plywood base ⑨
2. plywood base 1" x 1 1/2" x 5" formed to give a full line of contact
   of ⑨ with the Water Drum. Cut long along the flange
   tapering
3. mild steel bracing for long tubing ⑧ bent from 1/2" D
   1/8" wall steel tubing & welded
   to ⑥ and bar ⑤
4. 1/2" D x 5/8" long brass bushing (rotor
   shaft bearing)
5. do ⑭
6. 1/8" x 1/2" mild steel bar to which the actuator ⑬ is
   bolted (steel), hardened and ground, fitted under the
   link ⑦, the contact face to be 1/2" by
   1/2" and 1/8" x 1 1/2" by mild steel bar, to be fixed in
   accordance to convenience into the end slot of the
   solenoid plunger
7. Pin - attaching ⑨ onto the mounting arm of the solenoid
   plunger
8. Actuating solenoid & plunger
9. Allen-Bradley 1/2 H.P. 3 Ph. 60 cycle, 1800 r.p.m. 220 volt,
   N.E.C. Enclosed (Bulletin 860)
10. Capscrews & bolts anchoring the solenoid & solenoid to bedplate
11. 1/8" x mild steel gusset spanning from the solenoid to bedplate to
    the brake's baseplate

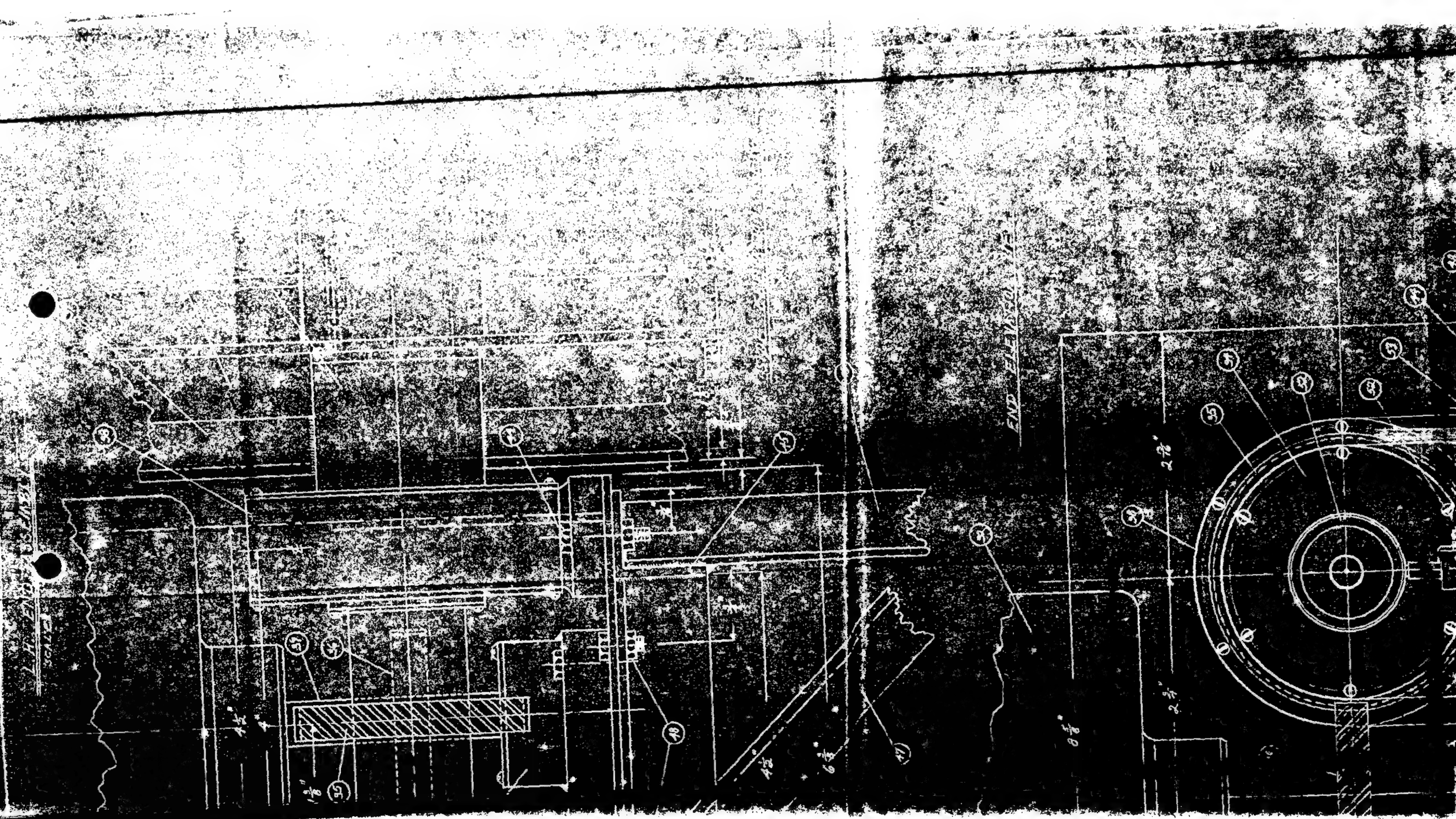
15. Identical with (1) except that this gusset is also welded to the gusset (17)
16. Legs of the solenoid's coil
17. 2" x 2" x 1/4" mild steel gusset plate running between one leg of the angle (18) and the baseplate (5)
18. 4" x 3" x 1/4" structural steel angle
19. #5 wood screws
20. "Knife" at the end of the solenoid's plunger
21. Retainer for the Recoil Spring (22). Dimensions to be determined by the designer. It is fixed into the "knife" portion (20) of the solenoid's plunger by any means that assures squareness of the Retainer with the plunger's principal axis
22. Helically wound Recoil Spring (Spring Steel)
23. Recoil Spring Mount for Recoil Spring. Mount of mild steel plate. Identical in all respects to Recoil Spring Mount of (1) except that the holes (24) are not tapped by Dwg. # 6
24. Holes for the screws (25) that fasten the Retainer (21) to the Recoil Spring Mount
25. Screws (#10-32) that fasten the Retainer (21) to the Recoil Spring Mount
26. Identical with (3) except for omission of mounting holes and the fact that the "knife" (20) which (24) is fixed
27. Mild steel gusset running between the angle (18) and the plate (5). Height of the gusset plate same as (17)
28. 7/16" drill for the mounting of the brake assembly
29.
30. Recoil Spring (22) in Plan Perspective

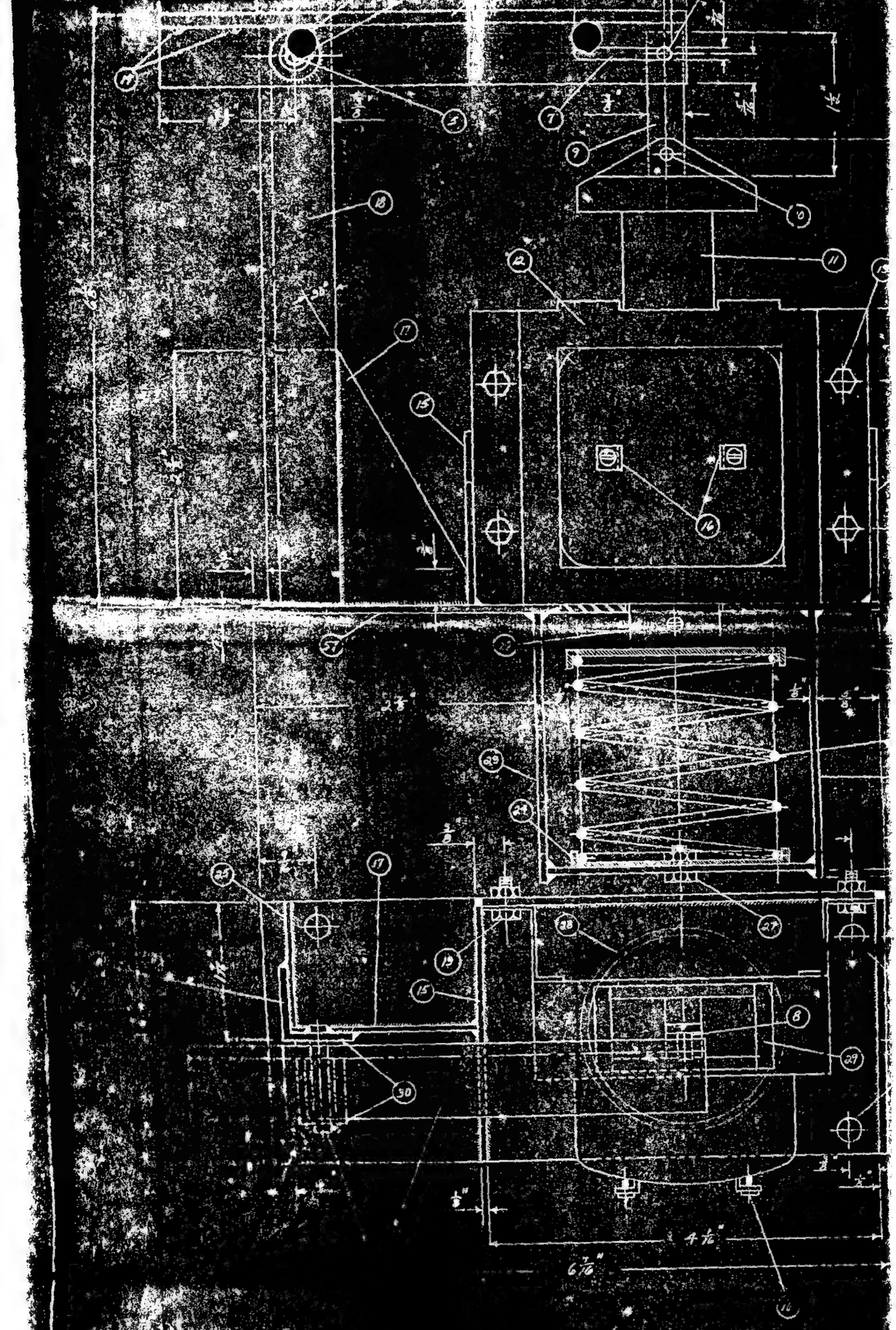
29. "Step" end of the Inboard & plunger as seen in Plan Perspective
30. Boston Gear Works ¼" I.D. x ⅜" O.D. x 3/16" Thk. Ball-Bearing Thrust Ring
31. ¼" O.D. Vinidi steel rod, welded as indicated into one leg of the angle (17)
32. Induction type Drive Motor (for further specifications see)
33. ¼" x 3" x 3" steel Sub-plate for the Drive Motor (see End Elevation View)
34. ½" shaft size ball bearing pillow block
35. Boston Gear Works 3" P.D. 60 tooth, L.H., 45° (Helix angle) ¾" face Helical gear *
36. Boston Gear Works 2.5" P.D. 50 tooth, L.H., 45° Helix angle ¾" face Helical gear *
37. Drive Motor's output shaft
38. ½" shaft size ball bearing pillow block
19. 2½" x 2½" x ¼" aluminum angle spoke of Outer Drum L.H. End-Ring
10. Outer Drum L.H. End-Ring
11. Hub of Outer Drum L.H. End-Ring
12. Hub of Inner Drum L.H. End-Ring
13. ¼" x 2" x ¼" aluminum angle spoke of Inner Drum L.H. End-Ring

Oil Bath in which gears run is not shown here. See Dwg. #8 of

Dwg. #6 REVISED

44. ¼" x 1" x ¼" structural steel angle tie member of L.H. A-frame
45. 1" x 1" x ¼" structural steel angle tie member of L.H. A-frame
46. ¾" x ¾" x ¼" structural steel plate of the L.H. A-frame
47. ¾" x 2" x ¼" " " " " strut member of the Main Truss combination (44) and (56)
48. ½" ø countersunk bolt nut tying (51) to (56) on the far end of (51) rotor from the end gear box
49. Outboard bearing for the Motor shaft
50. Base plate (59), and (54) mounted
51. Base plate for the Drive Assembly
52. Motor Generator Assembly
53. ½" ø tapered pin (37) to the rear plate (50)
54. ½" ø cast steel gusset plate. One at each end of the bedplate (52)
55. ½" x 1" x ¼" structural steel x welded to the bedplate (52) one at each end to stiffen (53)
56. 1" x 1" x ¼" structural steel x Angle tie member of the Main Truss combination (54) and (47)
57. 2" ø hole (108) Adapter for brake Assembly



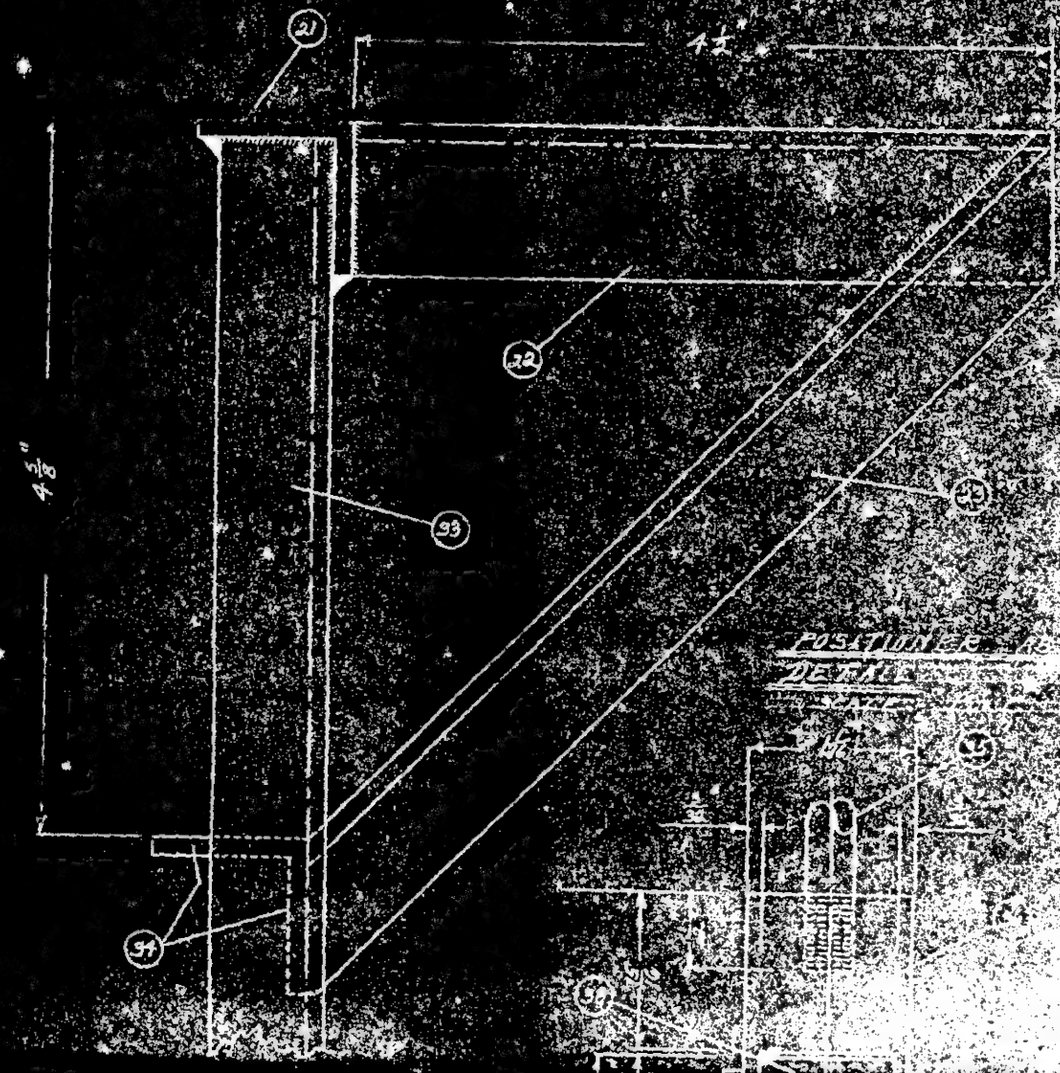

THE MIRIASCOPE — FOR A
RECTANGULAR C.R. TUBE
DWG. # 6 REVISED

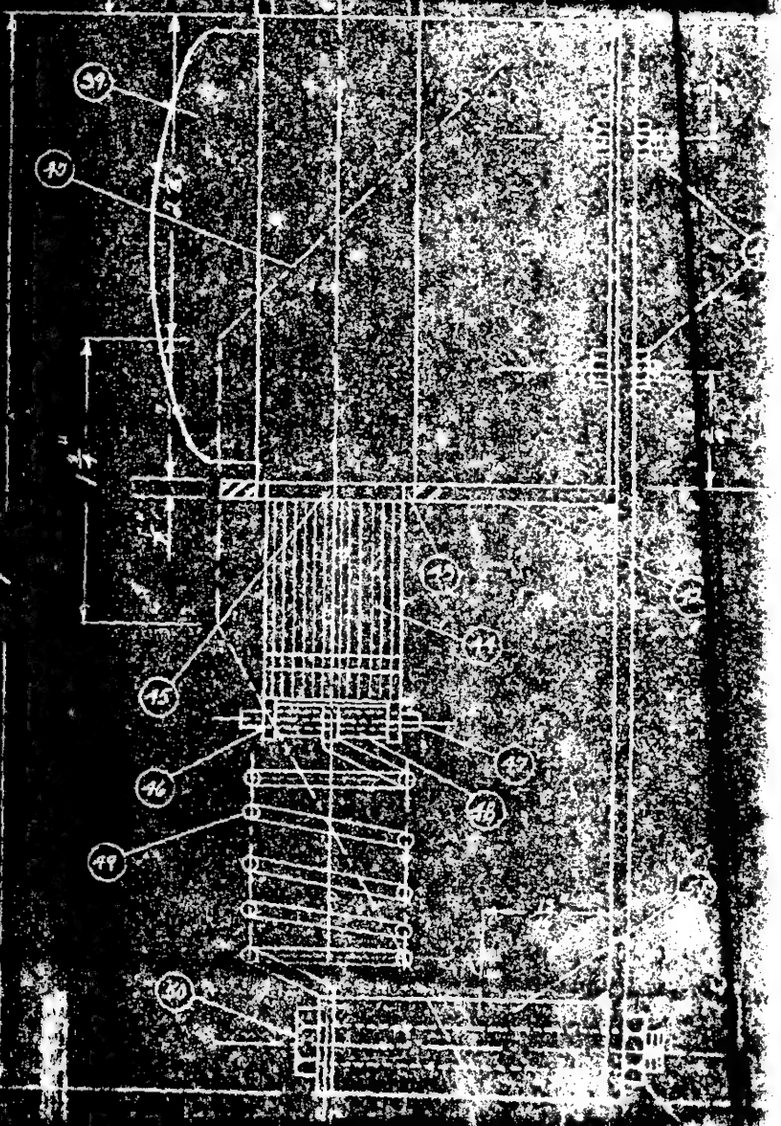
Dwg # 7 Revised

1. Weld Mtl Cover-plate
2. 5/16" Ø Rd. Hd. machine – 6 req. on 1 1/2" D.S.C.
3. S.A.E. 1020 steel housing, to be fabricated from 1 5/8" O.D. x 1 1/8" I.D. Tube Stock
4. 1/2" Shaft size Fafnir 1600 series, permanently lubed and sealed, ball bearing
5. Pad plate of 1/4" mild steel
6. 1/4" Ø Drills for mounting of pad plate
7. Outboard bearing member of the Pad-plate
8. Set Screw
9. Drill & tap for 1/4" x 20 setscrew to mount 1 1/2" shaft-eye ball bearing
10. Horizontal principal centerline of 1 1/2" shaft-eye ball bearing
11. Drill and tap for 1/4" allen Hollow Setscrew
12. Shoulder against inner race of 1 1/2" shaft eye ball bearing
13. 1/16" wide Keyway for 1/16" x 1/16" setscrew connecting the drawn-gear to the Main Drive Shaft
14. Keyway for 1/4" x 1/4" key connecting the hub member of the Front Drum L.H. End-Ring to the Main Drive Shaft
15. Shaft of 1 1/4" O.D. x 5/8" I.D. Stainless SAE 1020 steel Tube Stock
16. Direction of Rotation of the Drum Assembly
17. L.H. End Ring of the Center Drum
18. Positioner "B"

38. "Knob" portion of solenoid's plunger
39. Allen-Bradley Size #5, Wall Mounting Type, 110 V., 60 cycle, A.C. Bulletin 660 Solenoid
40. $\frac{1}{16}$" thk. molded phenol gusset plate between (43) and vertical portion of frame
41. Capscrew and nuts type mounting channel of solenoid to the bedplate member of the frame
42. Horizontal plate member of frame, 2 $\frac{1}{2}$" x $\frac{5}{16}$" x $\frac{3}{8}$"
43. Slot in (42) for plunger (44). Must be wide enough to accomodate "step" portion of the plunger
44. Plunger (armature end thereof) of solenoid
45. Pole faces of Electromagnet, against which (44) goes "home"
46. Mounting Wings on "step" end of plunger
47. $\frac{5}{16}$" ø shaft, pressed into drilled holes in the Mounting Wings (46)
48. $\frac{1}{4}$" O.D x $\frac{1}{8}$" I.D. steel tube spacers on both ends of spring number 1 to prevent sideward motion of spring
49. Recoil Spring (Specifications soon)
50. $\frac{1}{4}$" ø capscrew and nut anchoring the bottom end of the Recoil Spring (49)
51. $\frac{5}{8}$" O.D x $\frac{1}{4}$" I.D. steel tube-stock welded to bedplate of frame
52. Nut member of (50)

ITEM "FC"
SCALE: 1"=1"





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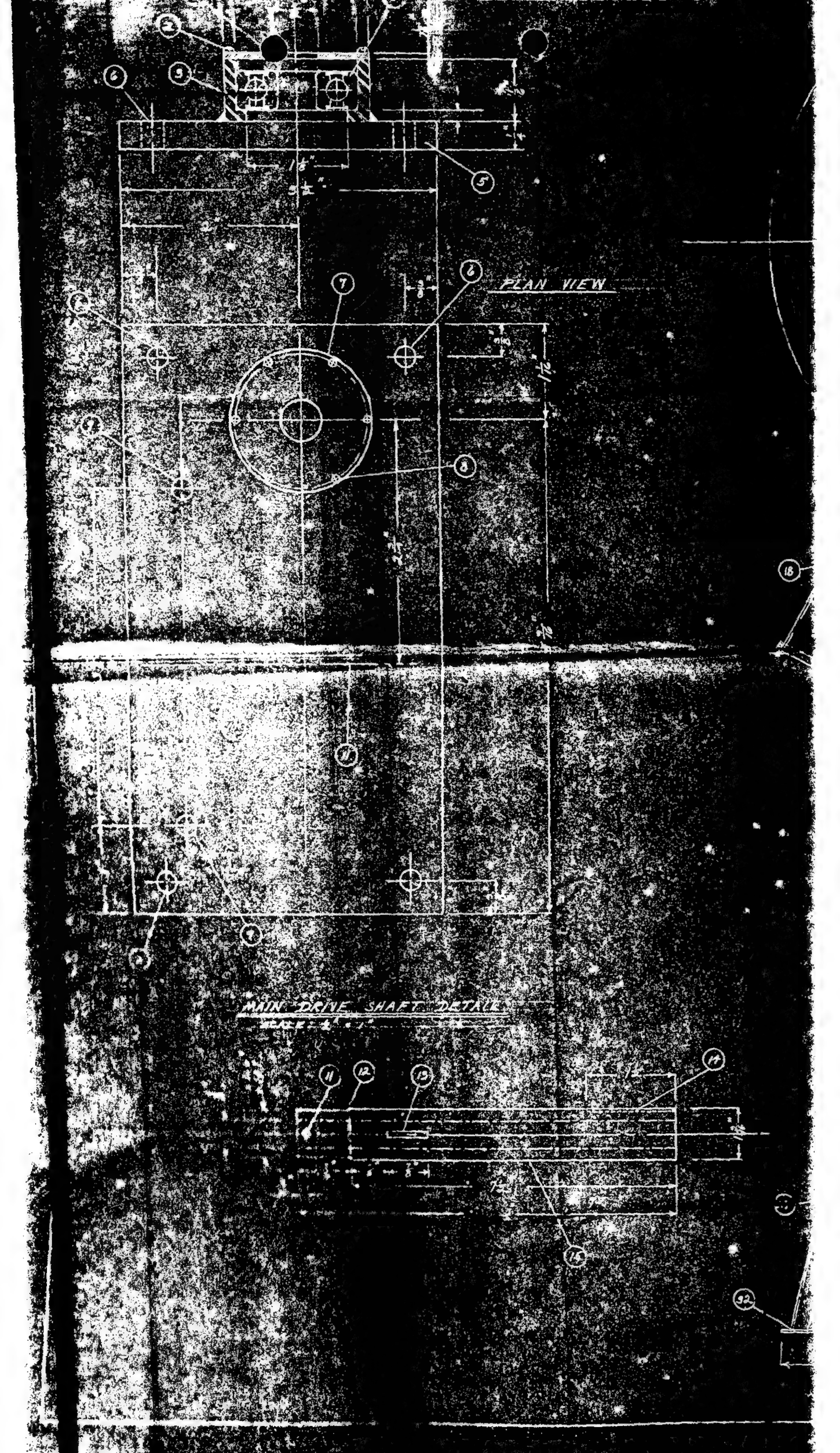
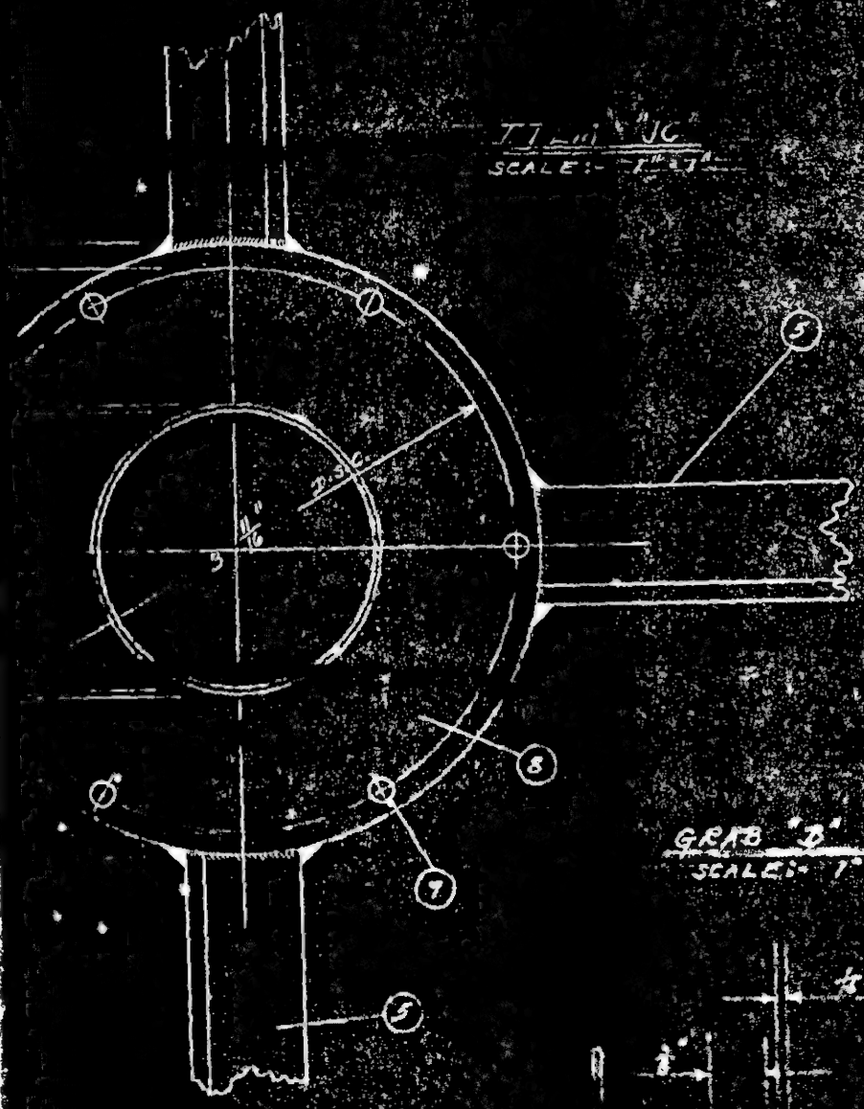
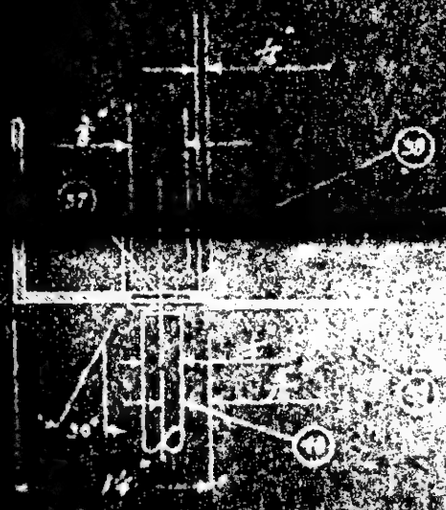
THE MIRIASCOPE — FOR A
RECTANGULAR C.R. TUBE
SHT. 1 REVISED


PLAN VIEW
MAIN DRIVE SHAFT DETAIL



GRAB "B" DETAIL
SCALE:- 1" = 1"



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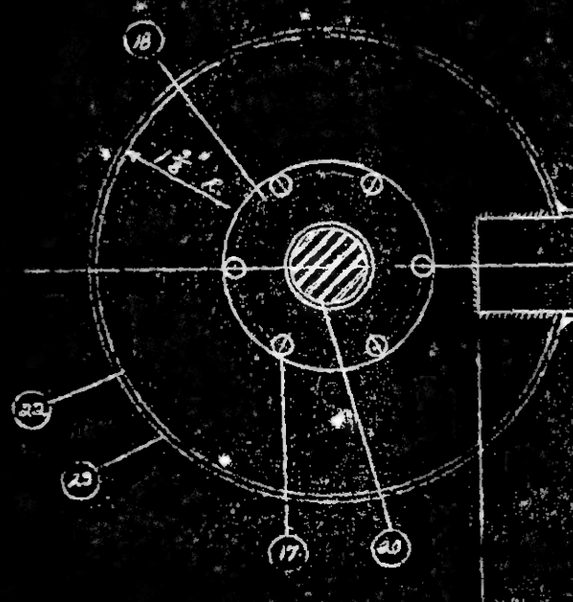
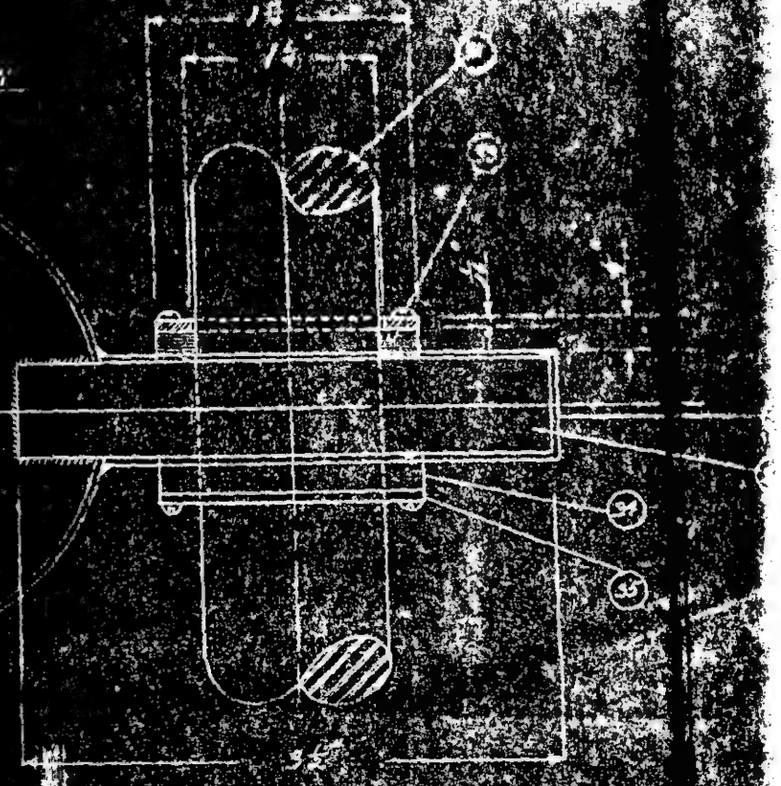
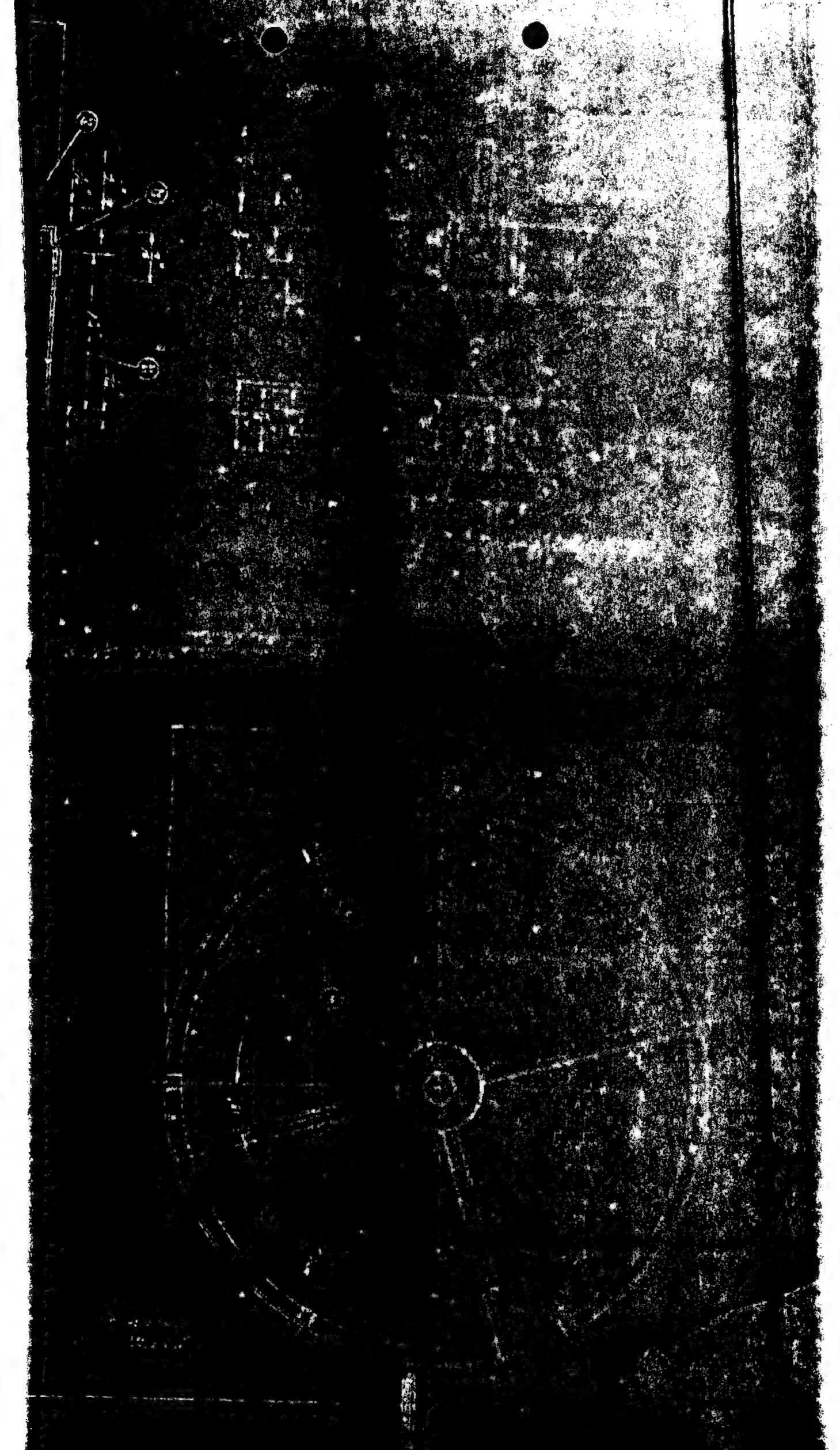
PLAN VIEW

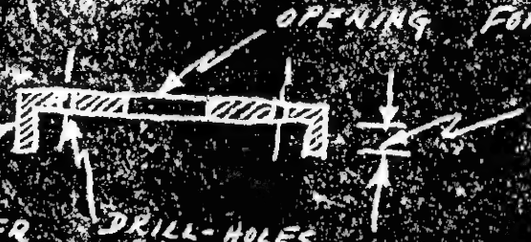






DWG. # P ; REVISED

1. Rim of $\frac{3}{4}$" x $\frac{3}{4}$" x $\frac{1}{16}$" aluminum angle
2. Flat web of Inner Drum End-Ring (R.H.) See Item "JB" & "JC"
3. Flat web to connect the axle member of each "support member" to end-ring - See Item "JD" - 6 reg. equi-spaced
4. For details of the spoke-to-rim joint, see Item "J3"
5. $\frac{3}{4}$" x $\frac{3}{4}$" x $\frac{1}{8}$" aluminum angle spoke
6. Aluminum Axle-Housing - fabricated from 4" aluminum round stock, or 3" O.D. x 1" I.D. tube-stock - if available
7. Heavy duty 1000 lb. capacity shaft-age permanently sealed and permanently-lubricated ball bearing
8. Aluminum plate flange-plate
9. $\frac{1}{4}$" x $\frac{1}{4}$" fillet weld all mating surfaces - 6 reg. on 3 $\frac{11}{16}$" D.S.C.
10. $\frac{1}{2}$" x $\frac{1}{2}$" x $\frac{1}{16}$" aluminum angle rim, as per (1)
11. Similar to (5)
12. $\frac{5}{16}$" x 1 $\frac{1}{4}$" lg. capscrew & nut - 2 reg. per "support member"
13. Each portion of "support member assembly" to be fabricated from mild steel bar-stock. (13) in particular, refers to the roller-bearing portion of the axle
14. Reinforced portion of the axle member, see (13)
15. Side-plate of $\frac{1}{16}$" D x $\frac{3}{16}$" x $\frac{1}{4}$" plate welded to both legs of the above angle as indicated
16. $\frac{3}{4}$" x $\frac{3}{4}$" x $\frac{1}{16}$" aluminum angle rim
17. $\frac{1}{16}$" x $\frac{1}{16}$" fillet weld all mating surfaces - 6 reg. Extending into properly drilled hole in the top of (23)
18. Retainer Ring - of mild steel bar. To retain with a side-wall to maintain the outward "creep" of the felt strips as they are compressed around, of course, the preferred. Such a Retainer would be as shown below:-



19. $\frac{1}{8}$" thk. medium soft felt ring. 2 may be used to allow for a greater "area-of-contact" with the shaft.

20. Output shaft of the Drive Motor.

21. Keyway for $\frac{1}{16}$" x $\frac{3}{16}$" key between driving gear and the output shaft of the Drive Motor.

22. 24 gage sheet steel, galvanized, metal member (22), which is formed to an approximately 360° surface-of-revolution of a line about the ℄ of the Motor-shaft; together with (31) forms the 'top half' of the bath. The bottom edge of the 'top half' of the bath forms the male member of the joint between the 'top' and 'bottom' halves of the bath.

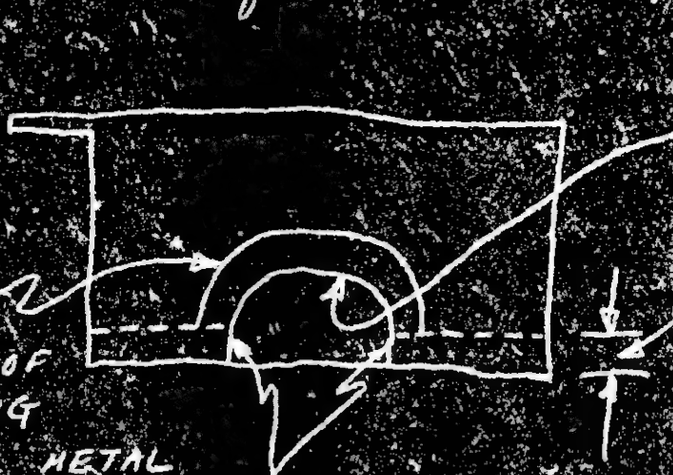
23. 24 gage sheet steel, galvanized. Member (23), which is of the same shape as (22) for the most part, together with member (32) form the 'bottom half' of the bath. The top edge of (23) and (32) are flared to form the 'female' member of the joint between the 'top' and 'bottom' halves.

1. 50-tooth, $\frac{3}{8}$" face, 45° helix angle, 2.5" P.D., L.H., helical gear, steel.

5. Housing for Sherlock Klozure. To be formed from $1\frac{5}{8}$" O.D. x $\frac{1}{16}$" I.D. seamless S.A.E. 1020 steel tube-stock, and brazed

or welded to member (25).

26. $\frac{1}{16}$" ø x $\frac{3}{16}$" lg. rd. hd. mach. screws — 6 req. on $1\frac{3}{4}$" B.C.
27. Garlock $\frac{1}{4}$" x $\frac{1}{4}$" double-lip Klozure leather or felt seal
28. The end of shaft enters the Outboard Bearing on the Pad-plate
29. Key between driven gear and the Main Drive Shaft - Key is $\frac{3}{16}$" x $\frac{3}{16}$"
30. Member (30) is notched for the Main Drive Shaft as indicated below:



31. Main Drive Shaft. See Dwg. #7 REVISED. Though shown here as a solid shaft, the Main Drive Shaft is hollow in fact.
32. Member (32) is correspondingly notched for the Main Drive Shaft as in member 30, and a portion of a felt ring is similarly glued beneath the flare to make-up to the felt-rings (31).
33. $\frac{1}{16}$" ø x $\frac{3}{8}$" lg. rd. head machine screws to draw-up on Retainer Rings (35).
34. Medium soft felt rings, each $\frac{1}{16}$" thk. or one $\frac{1}{4}$" thk, making-up to glued portions of rings above noted in (30) and beneath the flared portion of noted in (32).

ENG. #P REVISED

35. Retainer Ring of sheet steel — 2 req., 1 each side of (30)
36. 1¼" x 1¼" x 1/16" thk. aluminum angle ring of Oil-Drum End-Ring (L.H.).
37. ~~Rod~~ Hole-member of Grab "B"
38. Departure Block of Grab "B"
39. Plastic Drum (NOTE:- In the immediate vicinity of the hole (37), in the longitudinal as well as girth directions, a general clearance for the hole is used. The dotted extension of (39) indicates the normal overlap of (39) over (36).
40. The plunger-member of Positioner "B" which consists simply of a square-finished drill-rod instead of the ball-joint assembly used in Positioner "A".

NOTE:- The normal oil level in the Oil Ball is indicated by the horizontal discontinuous line across the bottom of (32).

NOTES ON DWG. #9

Since Pages 112-117 and Pages 201-210 were written, the following changes have been made on Dwg. #9:- a) C16 has been equipped with 2 N.C. contacts instead of one N.C. as; b) has been installed in the circuit; and (c), C18 has been in the circuit.

The additional set of N.C. load contacts on C16 provides for the closing of C17 immediately after C16 engages. Thus, even after C17 has dropped out, to introduce a Time-Delay between the achievement of Black-and-White alignment between the two Drums and the disengagement of Position 'A'. The engagement of C16 leads not only to the disengagement of C18 and C19 but to the disengagement of C17's operating coil as well. Hence no member of the Black-and-White alignment section of the circuit is functioning during Black-and-White viewing.

The purposes served by C17 are commented on on Page 205 of the enclosure. [NOTE:- On Page 205, C17 is given as C18. Please note the change in legend.]. Also please read Page 209 in this connection.

The purposes served by C18 are commented on on Page 115 of the enclosure. The method of guarding against the Hazard raised by the Note on Page 115 is inadequate and incorrect. The solution provided by C18 is positive, since the setting of the Drive Motor into regular color-viewing service definitely awaits the tripping of C18 by the plunger member of Position 'A', and thus guarantees that the plunger pin is withdrawn from Slot "B" when the Drive Motor is set into regular color-viewing service.

(... continuation)

onto the departure block of Groove "B"; (b) a sliding of the latch-pawl down the slope of the departure block; and, (c), in consequence of (b), a return of C5's actuator to its normal position.

With the return of C5's actuator to its normal position, a signal would be caused to course from power supply across the normally-closed set of contacts of C5, and then across a normally-open set of contacts in the still-engaged relay C9, to one of the normally-open sets of contacts of C14. X

C19, it will be recalled like C13, remains engaged so long as C2 is in its "color" position and C15 is not engaged. Therefore, the signal originating at the normally-closed set of C5's contacts is relayed across the indicated normally-open set of contacts in the now-engaged C19 to pass across a normally-open set of load contacts in the now-engaged C1 and appear finally at the upstream-side of the normally-closed set of auxiliary contacts of C11. Here, the signal results in the engagement of C11.

The engagement of C11, by the closing of its normally-open ~~load~~ load contacts opens a path for a succeeding signal from the normally-open set of contacts in C5 to be applied to the normally-open set of auxiliary contacts in C12. Thus, when Groove #2, during the completion of the bevel which is initiated when C12 engages, causes the latch-pawl to traverse the approach block of Groove "A", the actuator of C5 is tripped, and a signal is caused to course from the downstream side of the normally-open contact of C5 across the normally-open set of load contacts in the still-engaged C7, and thence across the normally-open set of load contacts in the still-engaged C9, to the upstream side of one of the normally-open sets of contacts of the conventional relay C14. Since C14 is still engaged, this signal is then relayed across a normally-open set of load contacts in C11 to wind up ultimately at the upstream-side of the normally-open set of auxiliary contacts of C12. The application of this signal to the mentioned set of auxiliary contacts causes an energizing of the disengaging section of the operating coil of C12, a resultant disengagement of C12. Accordingly, the power signal to the drive-motor is interrupted, and, in net effect, the motor is disengaged at such as the latch-pawl moves to the ~~the~~ slope of the approach block of Groove "A". The engagement of the latch-pawl in Groove "A" is a grab-slot in

then accomplished on the basis of the residual momentum of Drum #2

SENDING THE COLOR-VIEWING-ALIGNED DRUMS INTO ACTION:-

Once the latch-pawl drops into Grab "A"'s slot, the actuator member of C5 returns to its normal position, and, with C12 in its now-disengaged position and C11 in its still-engaged position, a path is opened for a signal from the downstream side of the normally-closed set of contacts of C5 to the operating coil normally-closed set of auxiliary contacts of the mechanically-held relay C15. The application of the mentioned signal to the normally-closed set of auxiliary contacts of C15 leads to the engagement of C15. The signal which accomplishes this task proceeds from the downstream side of the normally-closed contacts of C5 across a set of normally-open contacts in the still-engaged relay C9 to the upstream side of a normally-open set of contacts in the conventional relay C14. From the point, it travels across the mentioned set of contacts in the still-engaged C14 to a normally-closed set of contacts in the now-disengaged mechanically-held relay C12, from which point it is relayed to a normally-open set of load contacts in the still-engaged C11. The still-engaged C11 permits the mentioned normally-open set of load contacts to convey the thus-relayed signal to the upstream-side of the normally-open set of auxiliary contacts of the mechanically-held relay C15. As indicated above, the eventual travel of the signal to, & normally-closed set of auxiliary contacts of C15 leads to the energizing of the engaging section of the operating coil of C15, and hence to the engagement of C15.

For its part, the thus-accomplished engagement of the mechanically-held relay C15 leads to:-

a) the application of a maintained and continuous energizing signal to the Drive Motor

b) the discontinuation of phase supply to the solenoid of Positioner "B" and the conventional relay C14

and,

c) the sending out of a "disconnect signal" to C9 and C7

The discontinuation of phase supply to the solenoid of Positioner "B" and the conventional relay C14 according to (b) above takes place via the opening of the normally-closed set of load contacts in C15 when C15 is disengaged. The discontinuation of phase supply to C13, the solenoid member of Positioner "B", means the retraction of the plunger-member of Positioner "B" from the drill-hole member of Grab "B". This retraction of the plunger-member (see Dwg. #9) takes place under the action of the recoil spring member of the Positioner assembly. The retraction of the plunger-member of Positioner "B" from the drill-hole member of Grab "B" clears the impediment to the Drum Assembly's going into action which the energized Positioner constitutes. The simultaneous discontinuation of phase supply to ~~Positioner "B"~~ the conventional relay C14 means the de-energizing of C14, and the breaking of the paths whereby the 'activating' signals for C11 and C12 are transmitted.

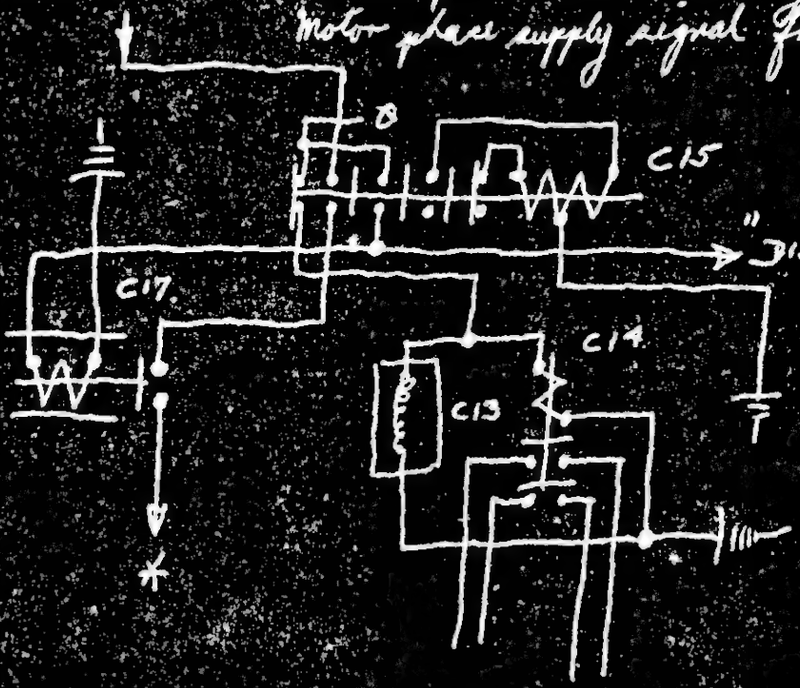
The application of a maintained and continuous energizing signal to the Drive Motor according to Item (a) above is accomplished by the 'making', or closing, of a normally-open set of load contacts in C15 when C15 engages. The noted above, since the plunger-member of Positioner "B" is withdrawn from the drill-hole member of Grab "B" simultaneously with the application of the energizing signal to the Drive Motor, both conditions for the setting of the Drum Assembly into action are accomplished with the engagement of C15:-

1. the plunger-member of Positioner "B" as a holding agency against rotation of the Drum Assembly is removed

and

2. the continuous power supply for the Drive Motor which is required for its operation in color-viewing is supplied.

NOTE:- The simultaneity of action which C15 establishes between the retraction of the plunger of C13 and the energization of the Drive Motor raises the question as to whether the slowness of the recoil action of plunger assembly could result in a jamming of the plunger in the drill-hole of Grab "B" and a possible consequent stalling of the motor. To forestall such an eventuality, it is suggested to place a time-delay relay in the path of the motor phase supply signal from C15. Thus, in the circuit shown below, the on-delay timing relay C17 would delay the application of the energizing signal to the Drive Motor for a sufficient period of time to guarantee the retraction of Positioner "B"'s plunger from the drill-hole of Grab



thereby eliminating of question of jamming of the plunger or stalling of the motor.

Now, let us return item (c) above, namely the 'disconnect' signal to C7 and C9. [NOTE:- Observe that in the sketch given above a 'tap' off the signal to C7 and C9 is used to activate the in-delay timing relay C17]. By its very nature, the 'disconnect' signal to C7 and C9 is a 'clear-the-board' signal which readies the "black-and-white alignment" section of the control circuit for its next call to action. This 'disconnect' or 'clear-the-board' signal is accomplished via the closing of a normally-open set of load contacts in C15 when C15 is energized.

In connection with the 'clear-the-board' signal from C15 to C7 and C9, it might be well to point out that a 'clear-the-board'-signal for the case of the mechanically-held relay C16 is provided via a 'tap' from the color-position contact of the 2-position selector switch C2. Thus when the 2-position selector switch C2 is turned to its color-position, C16 is 'cleared' for its next service in the functioning of the "black-and-white alignment" section of the control circuit. No activation of any portion of the "black-and-white alignment" section of the control circuit follows from this since the turning of the selector switch C2 to its color-position performs removes power supply from the "black-and-white alignment" section of the circuit.

Finally, it should be observed that the 'clear-the-board' signal for the "color-alignment" section of the circuit [in particular for the C15 and C11 components thereof] is obtained by a 'tap' from the black-and-white position of the 2-position selector switch C2. Thus, simultaneously with the next calling of the 'black-and-white' alignment section of the circuit into action

The robot-alignment section of the control circuit is readied for its next call to duty.

ERRATA, ADDENDA, & COMMENTS

RE: PAGE 1-27, THE MIRIASCOPE

PRINCIPAL DIFFERENCES BETWEEN THE ORIGINALLY SUBMITTED DESIGN & THE DESIGN SET FORTH ON ~~PAGES~~ DWGS #1-9:

It is hereby outlined the Miriascope were set forth in a series of drawings sketches numbering 19 sheets of which the last were devoted to a proposed Control Circuit. The balance were devoted to detail aspects of the design. The original design, its objectives, its fundamental principles, and its detail aspects were covered in a 27-page document beginning with an entitled communication dated 9/6/51, & a series of 9 formal drawings were submitted which in many respects differed from the originally-submitted drawings (Sheets 1 thru 19). The differences are for the most part in detail aspects of the design rather than ~~in~~ principles.

* * * * * * * * *

NOTE - In the series of drawings numbered #1-9, it will be found that successive drawings in dealing with any detail may differ. Such differences when they occur between succeeding drawings are intentional, and are meant to convey revisions of the design as given in previous drawings. Hereof, any and all conflicts between successive drawings are to be construed in favor of the drawing bearing the most recent series number.

IMPORTANT

* * * * * * * * *

Positioner "A" via a normally-closed set of load contacts in the mechanically-held relay C16; while, on Sht. #19, the same signal is passed directly from the mentioned set of load contacts in C3 to C8 and C6 without any interposed relay effects;

b) on Dwg. #9, C15 is indicated as a mechanically-held relay; while on Sht. #19 it appears as a conventional relay;

c) on Dwg. #9, the mechanically-held relay C9 appears as a 3 N.O. - 1 N.C. unit, the mechanically-held relay C10 as a 2 N.O. - 1 N.C. unit, and the mechanically-held relay C7 as a 2 N.O. - 1 N.C. unit. On Sht. #19, C9 appeared as a 2 N.O. - 2 N.C. unit, C10 as a 2 N.O. unit, and C7 as 1 N.O. - 1 N.C. unit;

and,

d) in correspondence to the above-mentioned equipment changes, certain details of the functional patterns have been altered.

The addition of C16 to the circuit as per (a) has been for the purpose of providing for the disengagement of C6 and C8 after the re-alignment of the Drums for "black-and-white" viewing has been achieved. By so doing, any A.C. chatter associated with the continued engagement of C6 [the solenoid member of Positioner "A"] and C8 [the on-delay timing relay] is eliminated; and, further, any disturbing effects due to a continued feeding of these equipment items is eliminated.

Associated with the addition of C16 to the "black-and-white" alignment section of the control circuit are the above-noted changes in the specifications for C10 and C7 and, in part, the changes in the specifications for C9. From a reading of pages 101-111, it will be observed that:-

A. when the arresting of the Drum Assembly and the disengagement of the latch-pawl from Knob "A" is accomplished as the first step in the re-alignment of the two drums for black-and-white viewing; C9 is ~~[illegible]~~ engaged;

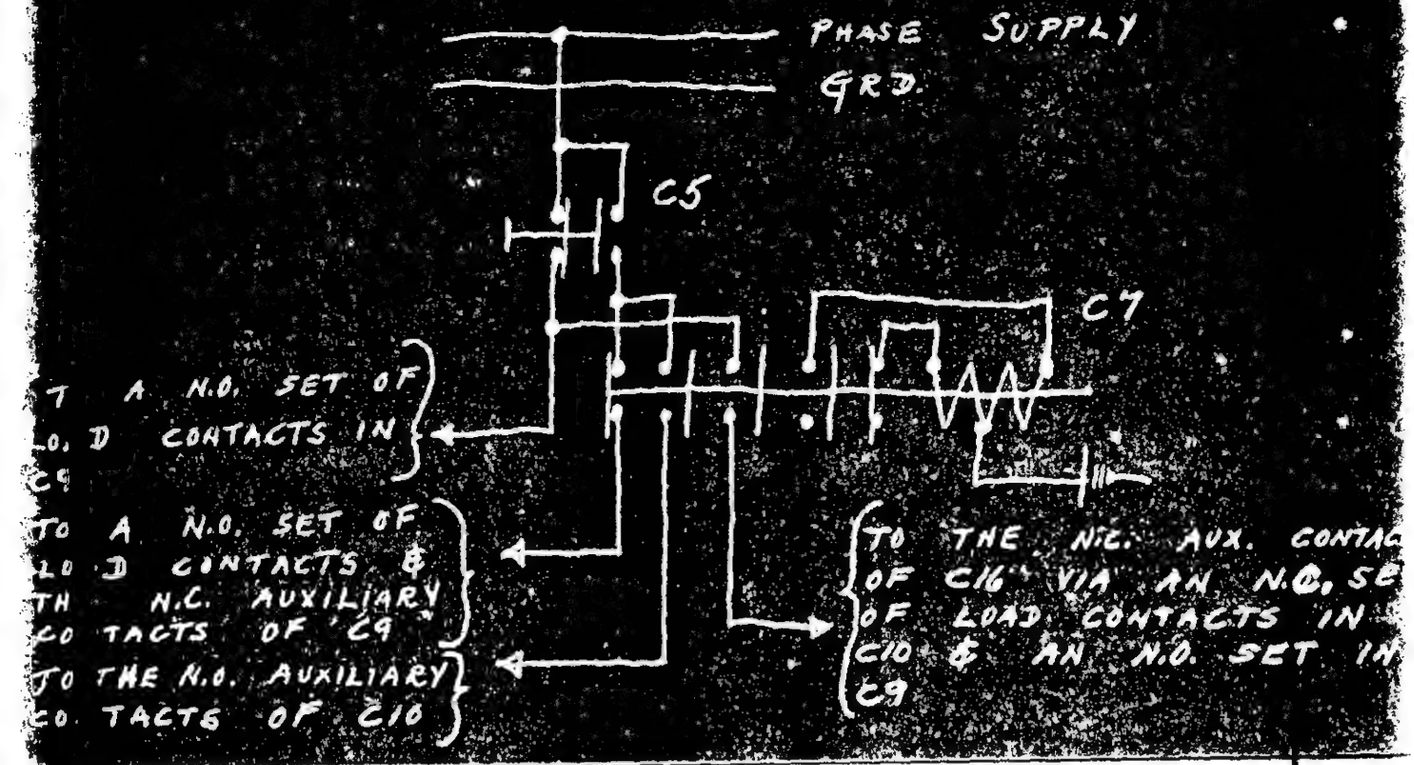
B. after C9 is engaged following the events mentioned in (A), C10 is engaged;

and,

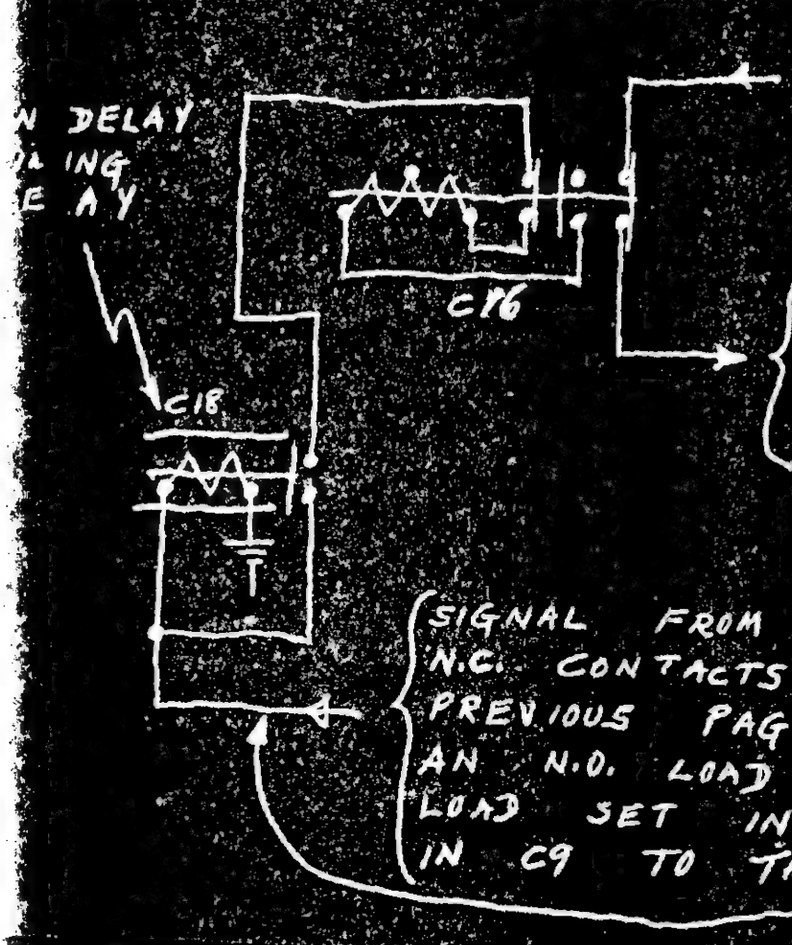
C. after C10 is engaged as a consequence of the engagement of C9 and after the ensuing motivation of Drum #2 alone results in the return of the latch-pawl to a position where it no longer trips the actuator of the Peanut Limit Switch, C7 is engaged

Studying the Miriascope Control Circuit as given on Dwg. # 9, it will be seen that when C7 and C9 are engaged, and C10 is disengaged, a path is opened for a signal starting from P'ase supply, and after transmission over an appropriate set of contacts in each of the mentioned relays, terminating at the normally-closed set of auxiliary contacts of the mechanically-held relay C16. The necessary conditions for the opened path, namely that C7 and C9 be engaged while C10 be disengaged, are fulfilled as a sequel to item (C) above. From pages 101-111, it will be found that after C7 is engaged as per (C) above, C10's disengagement is made responsive to a signal starting from the normally-open set of contacts in the limit switch C5. This signal which is transmitted across a normally-open set of load contacts in C9 to the normally-open set of auxiliary contacts in C10 occurs when the latch-pawl of Drum # 2 has already mounted the appropriate block of Knob "B" during the Drum's travel towards the black-and-white viewing required position. It will also be found in the "Description ....", pages 101-111, that the mounting of the approach block of Knob "B" by the latch-pawl member of Drum # 2 is followed shortly thereafter by a locking of the latch-pawl

i.e. the grab-slot of Groove "B", signifying the arrival of Drum #2 at a position which is consistent with a proper alignment of the clear slot of Drum #2 with a clear slot in Drum #1 for the purpose of black-and-white viewing. Thus, since the signal which which engages C16 (and consequently disengages C6 [the solenoid of Positioner "A"]) occurs when the locking action between the two Drums is impending rather than completed, it may be argued that a possibility exists that the ultimate absorbing of the flywheel energy of Drum #2 and the rotor of the Drive Motor could act to rotate the Drum Assembly's position past the 'window' in the cabinet. To obviate this possibility, it would be ~~possible~~ practical to draw the prime signal for the disengagement of C16 from the downstream side of the normally-closed set of contacts of C5 instead of from phase supply as now indicated on Dwg. #9. This scheme is illustrated below:-



By the scheme illustrated above, the signal engaging C16, and consequently disengaging the Drum Assembly-arresting action of the plunger of Positioner "A", would await the completion of the locking-action between the Drums. This means as well that the newly-aligned Drums would be prevented from slipping past the 'window' in the cabinet. Any further assurance that the newly-aligned Drums should not slip past the 'window' would be obtained from introducing a time-delay factor between the completion of the afore-mentioned locking-action and the retraction of the Plunger of Positioner "A" from the drill-hole of Grab "A". If this were done, then a way of doing it would be as indicated below:-



Of the matters raised on page 202, only one has thus far not been discussed, and this is Item (b) dealing with relay C15. On Sht. #19, as is recalled in Item (b), C15 was indicated as a conventional relay; while on Dwg. #9, it appears as a mechanically-held relay. Two reasons underlie the change, of which the first is the more important:-

1. Sht. #19 indicates that the prime signal for the engaging of C15 originates at the N.C. contacts of C5, is transmitted across an N.O. load set in C9 to an N.O. set in C14, is then transmitted across an N.O. set in C14 to an N.C. load set in C12 to an N.O. set in C11, and, finally, is then applied to the plate-side of the operating coil of the conventional relay C15. This would demand that C9 be in its engaged position, that C14 be engaged, that C12 be disengaged, and that C11 be engaged for C15 to be continuously engaged during color-viewing. However, since ~~that~~ the engagement of C14 is dependent on C15 being disengaged, it follows that the engagement of C15 would lead to the disengagement of C14, which would in turn lead to the secondary disengagement of C15 —— and ultimately to a chattering relationship between C14 and C15. This is the prime reason for the change shown on Dwg. #9;
2. The second reason lies in the inadvisability of C15, or any other relay, being continuously energized during the operation of the TV circuit, since A.C. clatter and electrical disturbances to the operation of the TV circuit are possible. By making C15, a mechanically-held relay, the permanent engagement of C15 prior to

the disengagement of C4 is assured, and only, the engagement of C15 is established, it follows that engagement will not any further feed of power. The latter fact satisfies the above-mentioned conditions that no member of the switching circuit be capable of "chattering" or demand a continued feed of power during any working cycle, other than — possibly — the Tachometer Relay.

As C15 is now specified, its engagement follows the completion of the drum-disengagement action, for the engagement signal is transmitted along the following paths:-

a) the signal originates at the downstream side of the N.C. contacts of C5, which means that the 'latch-hand' of Drum #2 must be in its "low" position;

b) the signal so (a) is relayed across a normally-open load nut in C7, which means that C7 must be engaged — and this condition is satisfied since C9 "e" position is reversed only after C15 is engaged;

c) the signal as of (b) is applied from the downstream side of the N.O. 'hand' nut in C9 to the upstream side of an N.O. nut in C14, which means that C14 must be engaged for the further relaying of the signal — and this is satisfied since C14 is engaged during the C2 "e" position, at which time C15 is disengaged;

d) the signal as of (c) is applied from the downstream side of the N.O. nut in C14 to the upstream side of the N.O. nut in C15, which means that C15 must be disengaged for the relaying of the signal

— and this condition is satisfied by the fact that C12 is restored to its disengaged position once the latch-pawl of Drum #2 is brought to a given state of 'lift' by the approach block of Grab "A"

and,

e) the signal as of (d) is relayed from the downstream side of the N.C. load set in C12 to an N.O. load set in C11, which means that C11 must be in its engaged position for further relaying of the signal — and this condition is satisfied by the fact that C11 is sent into its engaged position by the 'drift' of Drum #2 past the departure block of Grab "I" during the travel of Drum #2 towards its color-realigned position with Drum #1, and further C11 maintains its engaged position until the next black-and-white relaying alignment is accomplished.

The signal as of (e) is then applied to C13. Since the 'lift' of the latch-pawl by the approach block of Grab "A" immediately precedes the locking of Drum #2 into its color-alignment position with Drum #1, it follows that C13 gets engaged only as color-alignment of the two drums is achieved or is imminently about to be achieved. By the refinement of the control circuit given on Page 175, it would follow that C13 would ~~close~~ engage to release Position "3", disengage C14, and restore C9 and C7 to their alternate positions only after color-alignment of the two drums has been achieved.

Thus Ltr (b) on Page 202 is explained.

IMPORTANT CONSIDERATIONS

Two important considerations affecting the projected design
control circuit. These are:

a) the type of mechanically-held relay used

b) the timing between the release of contactor "A"
Hook-and-roller adjustment has been achieved

It has been specifically set forth above that one of the function
served by the use of mechanically-held relays was to eliminate
[illegible] electrical disturbances due to the operation of the TV
relay coil, the functional demands on any given relay ca
to be met might embrace a wide variety of qualifications more or
before the type of relay circuit is specified. Explicitly, it wo
be desired that -

1. the holding of the relay in engaged position be accom
either by a mechanical or a magnetic latch

2. a second operating coil which overcomes the
mechanical or magnetic latching action be a pa
the relay

3. means be available for the holding of relay in their engaged po
are relatively common, and in fact, the name — mec
held relay — is derived from the original use of such
latches. More recently, it has been common to replace mech
latches by permanent magnets which hold the relay-plung
the plunger is driven against the permanent magnet pole-fa
either type of construction) which has been referred to as a m
latch is preferred since it is entirely mechanical latches a
subject to improper operation when the hardware to which
are attached are jarred.

Finally as regards the mechanically-held relays we

should be observed that to assure the best operation of such a relay, the two operating coils of the relay — the one which acts to engage the relay, and the other which acts to disengage or de-latch the relay — should be signalled thru auxiliary contacts which are operated in common with the load contacts. The contacts which are auxiliary to the engaging action — the N.C. auxiliary contacts — should have a dragging effect incorporated in them to assure the completion of the engaging stroke against a spurious or chattering 'making' action.

If the construction schedule for the models permits, I will design a set of relays suited in size and other characteristics to the demand of the Control Circuit.

On the subject of the decision to disengage Positioner "A" after black-and-white alignment of the Drums has been achieved, it has been held here that the inertia of the Drum Assembly and the Drive Motor rotor, plus the friction forces between the gears constituting the power transmission, would be sufficient to hold any previously established position once the desired Drum Assembly alignment and positioning in front of the cabinet window has been achieved. The further argument that a continued energizing of the Positioner solenoid might lead to 'chattering' and also to electrical disturbances to the T.V circuit's normal operation led to one of two solutions:-

* A. either construct the Positioner solenoids along mechanically-held lines;

or,

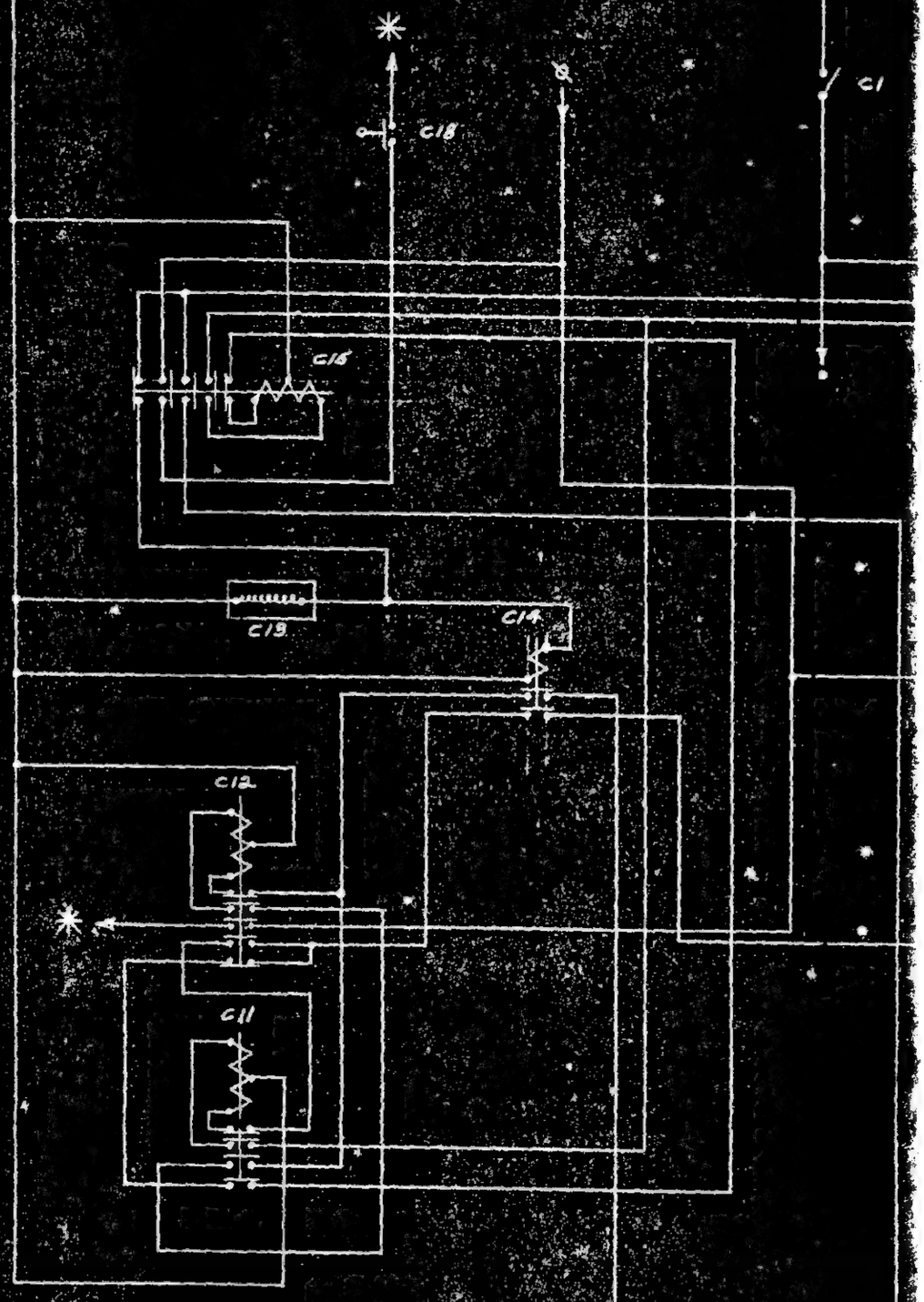
B. hold any given Drum Assembly position on the basis of the inertia and friction forces named above.

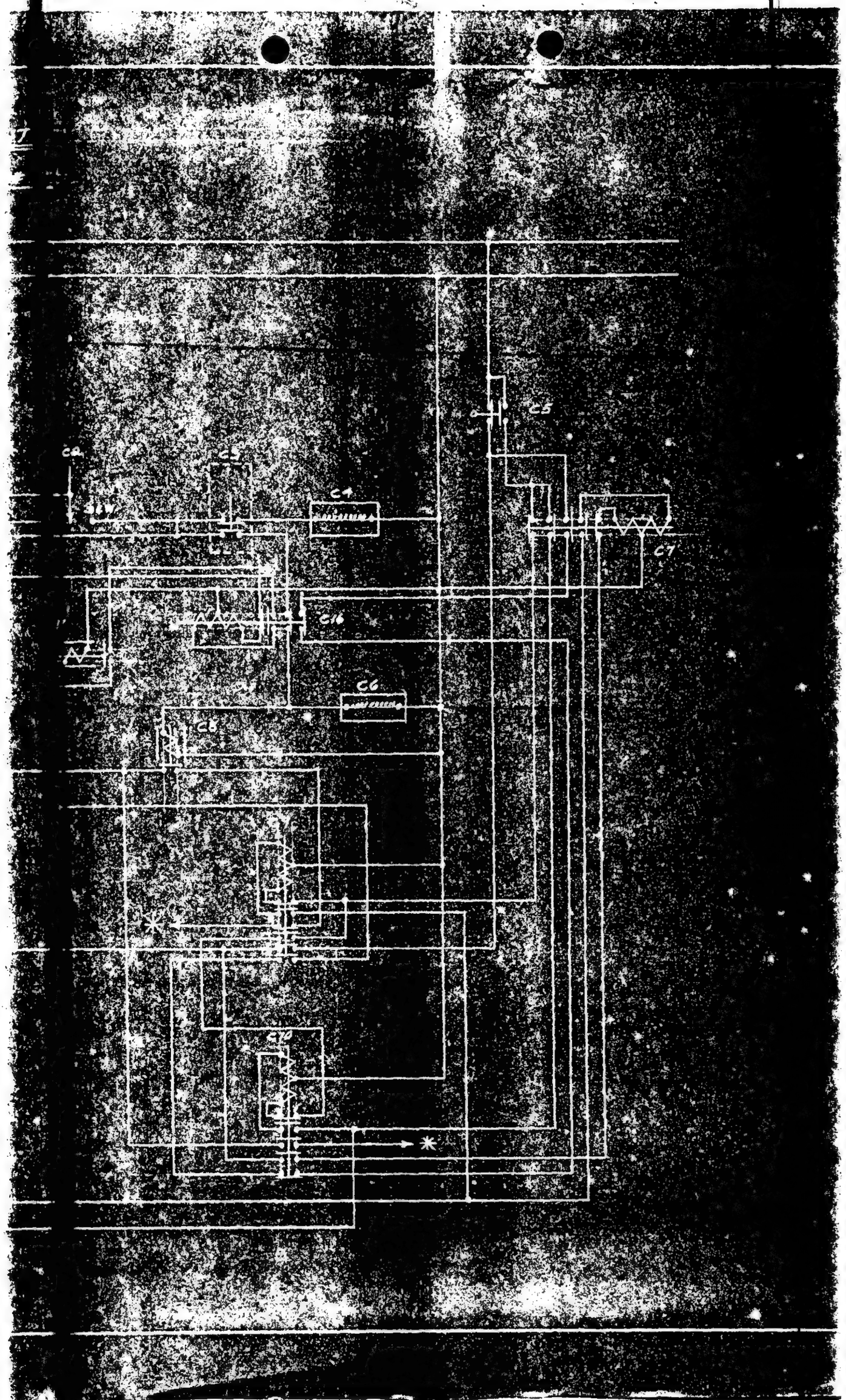
The latter was chosen for the reason of the costs involved in the former alternative.

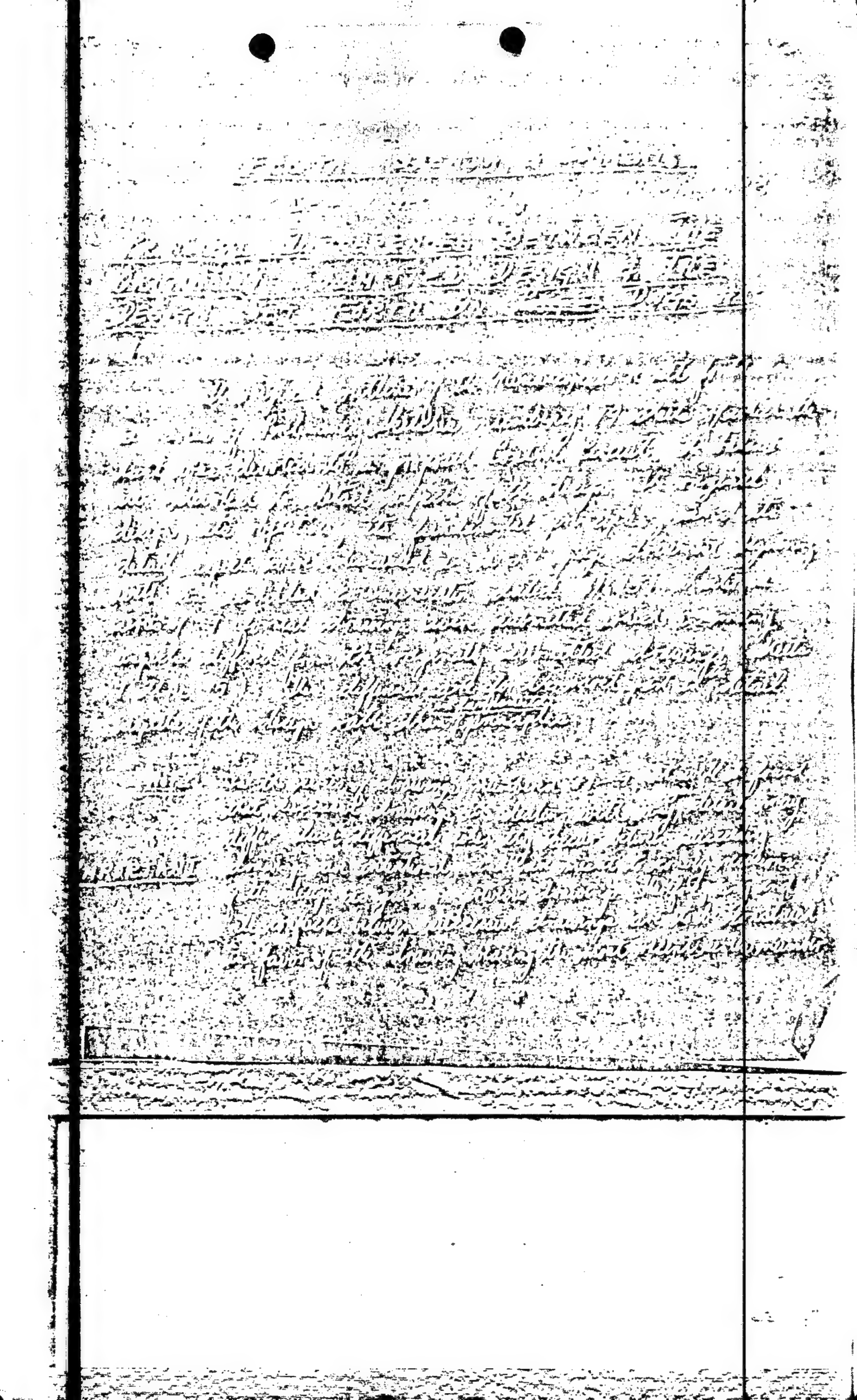
* NOTE:- Will see [illegible] Prof. [illegible] [illegible]

THE MIRIASCOPE CONTROL CIR

.DW




C5
C4
C7
C6



The principal provisions set forth by Dwgs. #1-9, as referred to Sheets #1-19, are the following:-

A. THE DECISION TO GIVE INNER DRUM END-RING (R.H.) A DOUBLE SUPPORT:- Dwg. #1 in its DETAILS "J" indicates that the Inner Drum End-Ring (R.H.) is to be a spoked ring, with its spokes attached at one end to a central hub and at the other end to an angle iron. "DETAILS "J" further indicates that the iron beam "support members" are to be on the inner side of the Outer Drum End-Ring (R.H.). The "double support" for the Inner Drum End (R.H.) in this case can then be said to consist of:- a) the spoked construction which supports the ring from the Stationary Shaft (Detail "O."); and, (b) the "support members" construction which supports the ring from the Outer Drum End-Ring (R.H.).

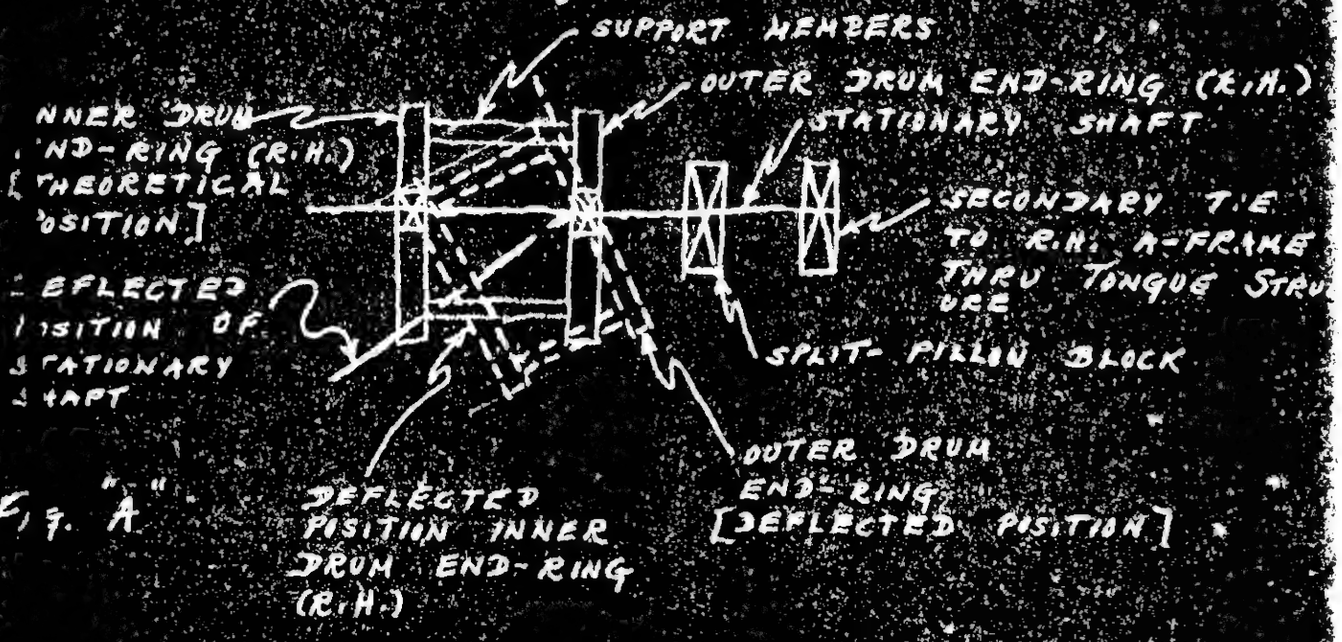


Fig. "A"

Fig. "A" sets forth the operative principles of the assembly which is obtained via the "double support" arrangement. It will

graphically be seen that the "support members" (as Drgs. #1 & 2) are a means of securing "squareness" between both rings and the stationary shaft about which they rotate, in that they (the "support members") establish a parallel alignment between both rings (as they are related to one another). Thus, if either of the rings were to depart from its theoretically "square" geometrical relationship to the principal axis of the shaft, the "support members" would force the other ring into a parallel alignment to the first, and, from the above support structure of the second, the second ring would communicate the slope of the deflected shaft at the first ring to the point at which the second ring is anchored.

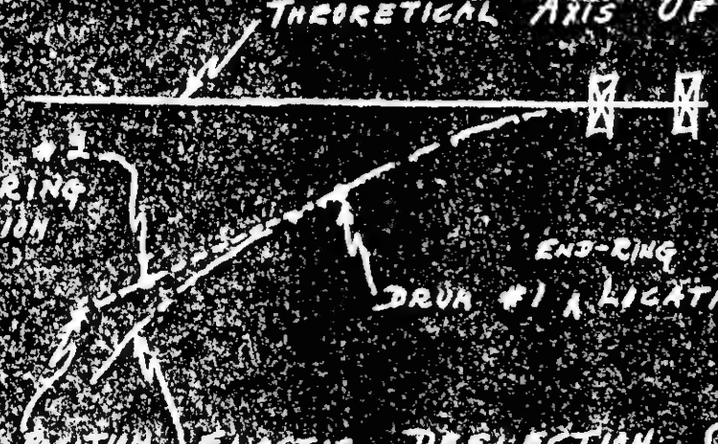


FIG. "3"

Fig. 3 illustrates the principle expressed above, and graphically, if a stationary shaft of a sufficiently small section, the R.H. End-Rings of an assembly would be parallel one. Having arrived at this conclusion, it [illegible] to a consideration of the R.H. End-Rings on the [illegible] shaft to [illegible] The [illegible]

used on the L.H. side ;—

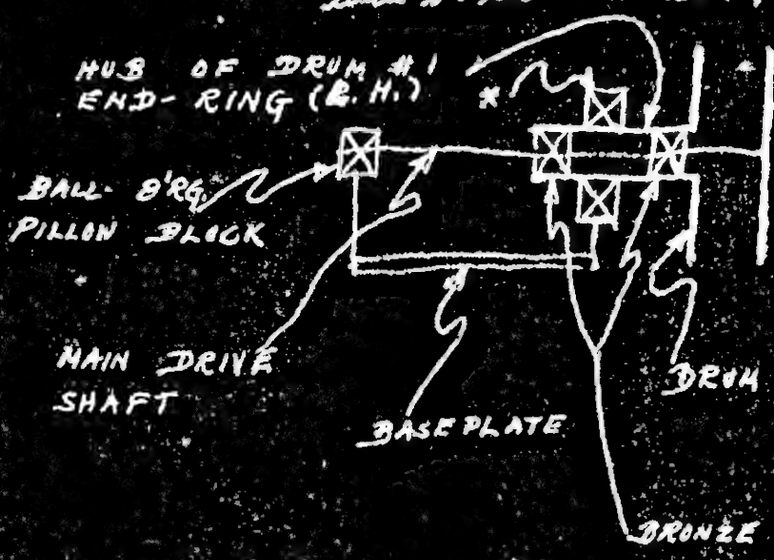


FIG. "C

Observing Fig. "C", it is clear that the Bronze Sleeve
are a means of preserving a parallel alignment betwe
two indicated End-Rings. Once this is clear, it
that if the two-aligned rings are now adequately
as an assembly the stable independence of the L.H.
Assembly is an established fact. The two ball-bear
block units provide this support for the assembly as
whole.

Thus, it will be seen that both the R.H. and the L
Rings-Assemblies form individually stable, and independ
devices. Each draws its fundamental stability fr
A-frame on which it is mounted. And as, if
connections between the two A-frames are made
a manner that the two A-frames are integrated
a stable and stiff composite structure, it will
that little if any of the responsibility for the ground

of the Periscope as a whole would be imposed on the slats comprising the Drum Assemblies. In fact, its and load imposed on the Drums would be transmission of the decelerating and the braking torques to the R.H. Torque Assembly. The narrowing of the structural and rigidity functions of the Drums to the ones which have just been cited makes it feasible to adopt the following lines of assembly and maintenance:-

a. In assembling the Periscope, it is possible to establish a sequence in which the four A-frames and their inter-connecting members are first put together to form the prime structure. Next, each of the End-Assemblies of the drums should be assembled into each of the A-frames. This should then be followed by a mounting of the C.R. Tube and its auxiliaries on the Mounting Plate (See Dwg. # 1) and a connecting of these members to the appropriate leads in the cable coming from the Hollow Shaft Member of the Mounting Assembly. With the foregoing having been accomplished, the slats for the Inner Drum, and later the slats for the Outer Drum, should then be fastened onto the appropriate End-Rings to yield a fully-assembled unit which is then placed in the Cabinet.

and,

b. In the replacement of the C.R. Tube or in checking the leads to the tube and its auxiliaries, this should be done by removing one or more adjacent slats in both Drums to get at the Tube Mounting Plate. The slats which may be removed for such purposes might best be clearly indicated by some special marking on the non-viewed ends of the slats.

It will already be surmised from what has already been said on the assembly and the maintenance topics that the "welded longitudinal seams and bolted slots" called for in the earlier sketches [and which were somewhat set forth in the earlier sketch #1-19] are to be abandoned in favor of an individual fastening of each slat to the appropriate End-Rings, with each slat remaining an individually constituted member not otherwise connected to the adjacent slats than by the "ring effect" of the End-Rings. As to the fit of each slat to its next adjacent slats, more will be said in the comments called for to follow on the fabrication of the slats themselves. It therefore just remains to say that as a result of the "double support" principle which has been built into the R.H. End-Rings, and because of the mutual parallel alignment feature which has been built into both End Rings - Assemblies, no reliance is now made on the Drum themselves towards the stiffness of the Assembly as a whole; and the comments on this regard worded appear on Pages 7 & 8 of the communication of 7/6/51 are therefore to be disregarded.

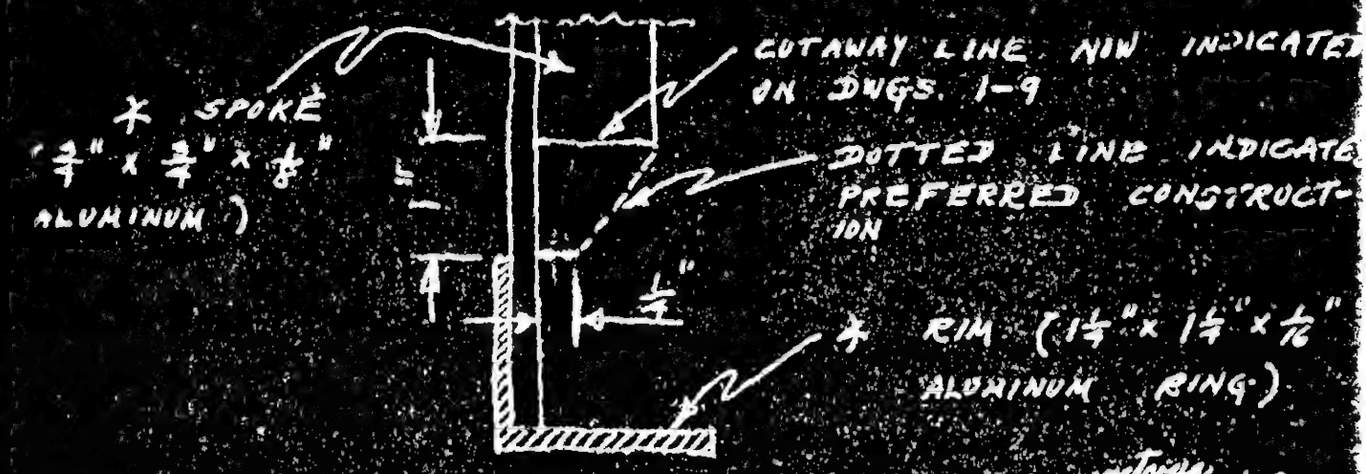
B. THE SPECIFIC DESIGN OF EACH OF THE END-RINGS:- In Drgs. 1-9, the rim members of the End-Rings have been specified to be of angle section, rather than the types of rims specified in Sheets #1-19. In the case of both Outer Drum End-Rings, the spoke formation has also been altered over that previously given. Combining the End-Rings rim members, the choice was of an angle section over the simple rectangular section previously indicated on Sheets #1-19 was dictated by the desire to give all of the rims a greater stiffness to out-of-roundness distortional influences. However, the use of an angle shape in the case of both Outer Drum End-Rings contributes towards the ability to employ spoke formation which would otherwise not be possible.

The shifting of the (dependence of the) structural (i.e. static) and dynamic soundness of the wheel as a whole from its previous base in the 'complete cylinder effect' of the Drums to its later base in the metal parts of the assembly was the principal motivating factor in going to an angle section for the rim. But the fact that the angle shape is a stronger form and the necessity (from the standpoints of ease of assembly and maintenance) for shifting from a dependence on the Drums for a weighty contribution to the strength and soundness properties of the assembly need no further discussion. Let us turn therefore to the way in which the angle rims have contributed to other aspects of the construction.

The 'other leg' of the angle rims employed, it will be seen, has served as:- a) a means of securing of firm joint between the rims and the spokes; and, (b) a means of anchoring such gadgetry as the support plate for the recoil spring and the limit switch components of the latch-pawl device (on the L.H. Inner Drum End-Ring) and the side-plate to which the the support arms of the "support members" are attached (in the case of the Inner Drum R.H. End-Ring). Specifically, on the periphery of both Outer Drum End-Rings, the inner surfaces of the rims must be 'clear' for the movement of gadgetry associated with the Inner Drum. This necessitates, in both instances, that one leg of the angle spokes be cut away to provide the necessary freedom of movement. The fact the Outer Drum End-Rings, are formed of an angle section, makes it possible to provide the necessary cut-away without risking a wobbling of these rings due to a weakening of the spoke, since the stiffness of the rims can be held to be transmitted in part to the one remaining leg (of the outboard spoke). ~~by which the rim is tied to the back member of each ring~~ Here, the fact that the remaining leg is welded along all of its line-of-contact to the side leg of the rim, and the strength properties of the

residual span of the cutaway length of the spoke, combine * to draw on the angle rim for a stiffness which could not otherwise be expected for the cutaway length.

A preferred construction in regard to the spoke-to-rim joint for both Outer Drum End-Rings would have been that shown below over that indicated in Dwgs. 1-9:-



In any case, the use of angle spokes in the outer Outer Drum End-Rings in the place of the constructions indicated in Dwgs. 1-19 which call for the use of channels tied into relatively complicated joints with each rim, is a move in the direction of space-saving and a more rigid construction for the overall design. The use of an angle section for the End-Rings and the use of angle spokes tied into angle shear stiff joints with the rims and hubs of the Ring-Assemblies is in fact a part of the general conclusion that the plastic Drums per se should not be depended on for any substantial contribution to the stiffness of the overall assembly.

a. THE CHANGES IN THE SPECIFICATIONS FOR THE BEARINGS:- Inspection of Dwg. 1-4, it will be

should that anti-friction bearings have been used solely for the machines in question are involved in color-viewing (that is, where the member-in-relative-motion experience duty for substantial periods of time), and, where the member-in-relative-motion experiences duty only during Drum-realignment, plain bearings have been specified to be above-type bearings of the "porous structure" type. Thus, the bearing between the Stationary Shaft and the Outer Drum End-Ring have been changed from the construction shown in Sheet #1-19 to an anti-friction bearing in Dwg. #1-9. With regard to the Stationary Shaft-to-Outer Drum End-Ring bearing, it is well to point out that the fact the clearance of appearance" with the Stationary Shaft, called for in the section shown on Sht. #12 would have contributed to alignment in the case of the presently-indicated construction by the Shaft-support effect between the two R.H. End-Rings, as was noted above, the reasoning behind the preference for anti-friction bearings when prolonged bearing duty is involved is, I trust, obvious.

B. THE DESIGN OF THE "SUPPORT MEMBERS":-

On Sheet #11 of the originally-submitted Sketch Sheets, bearing arms of phenolyl-methylene were proposed. These were to be attached to a at-that-time proposed plastic end-ring of the same material for the R.H. side of Drum #2. These "bearing arms" were to ride on the inner surface of the R.H. Outer Drum End-Ring, and to play a part not different from that now proposed for the "support members" on Dwg. #1 of the series Dwgs. #1-9.

The presently-proposed "support members", which involve a roller-action on an axle attached to the Inner Drum R.H. End-Ring, were substituted for the originally-proposed "bearing arms" because they are capable of taking a larger load and also because over a long period of time the presently-proposed "support members" would require less

maintenance and would be more nearly fool-

E. THE LATCH-PAWL MECHANISM ALTERATION:-

IMPORTANT PLEASE NOTE

Before discussing the alteration in the design of the latch-pawl, it would do well to point out a correction which should be made in the design now projected on Dwg. #1 of Dwgs. #1-9. As presently indicated on Dwg. #1, it would appear as if the 'cocked' position of the latch-pawl would involve its foot-member resting on the floor of the Outer Drum L.H. End-Ring. This cannot be allowed as that the released position of the spring (23 on Dwg. #1) controlling the pawl's position keeps the pawl just off the slatted floor. This would mean that there would be no scraping action by pawl's foot on the floor of the given End-Ring when Drum-realignment occurs; and, yet, the engagement of the foot-slot of either slat would not be all-effective as to the positiveness of engagement between the two Drums.

With the slight modification of the design shown on Dwg. #1, it is clear that the only 'contact' between the latch-pawl and L.H. End-Ring of the Outer Drum would occur when:- (a) the two clutches are engaged; and, (b), when the latch-pawl inserts the slope of either slat's approach-block. For the case where action (b) occurs, the rubber-covered roller on the shank of the pawl would give a noiseless rolling action which the design originally submitted on Sketch Sheet #1-19 would involve a scraping action between the latch-pawl and each approach block.

and,

F. THE SPECIFICATIONS FOR AND THE FABRICATION OF THE SLATS:-

The originally-submitted bill-of-materials and the document of 4/6/15 called for the use of "1/2" millboard sheet of either, saturated blue, saturated green, and saturated red colors.

at the time, these specifications were laid down it was the erroneous understanding of the writer that polymethacrylate sheet of the correct optical filter properties is available. This is apparently not true. It now appears that true colors depend on the use of filters of tight optical specifications. Against this latest information, it would appear that the optimum construction for the filter-plate would consist of Wratten Blue 47, Wratten Green #58, and Wratten Red #26 filter plates sandwiched in optical contact unwrinkled and unstressed from between two to "thk. polymethacrylate sheets preformed to the specified curvatures. [NOTE: - at a later date, some experimentation in the deposition of filter gelatins on one of the two methacrylate sheets forming each composite plate would be in good order, and instructions in this regard will be furnished.]

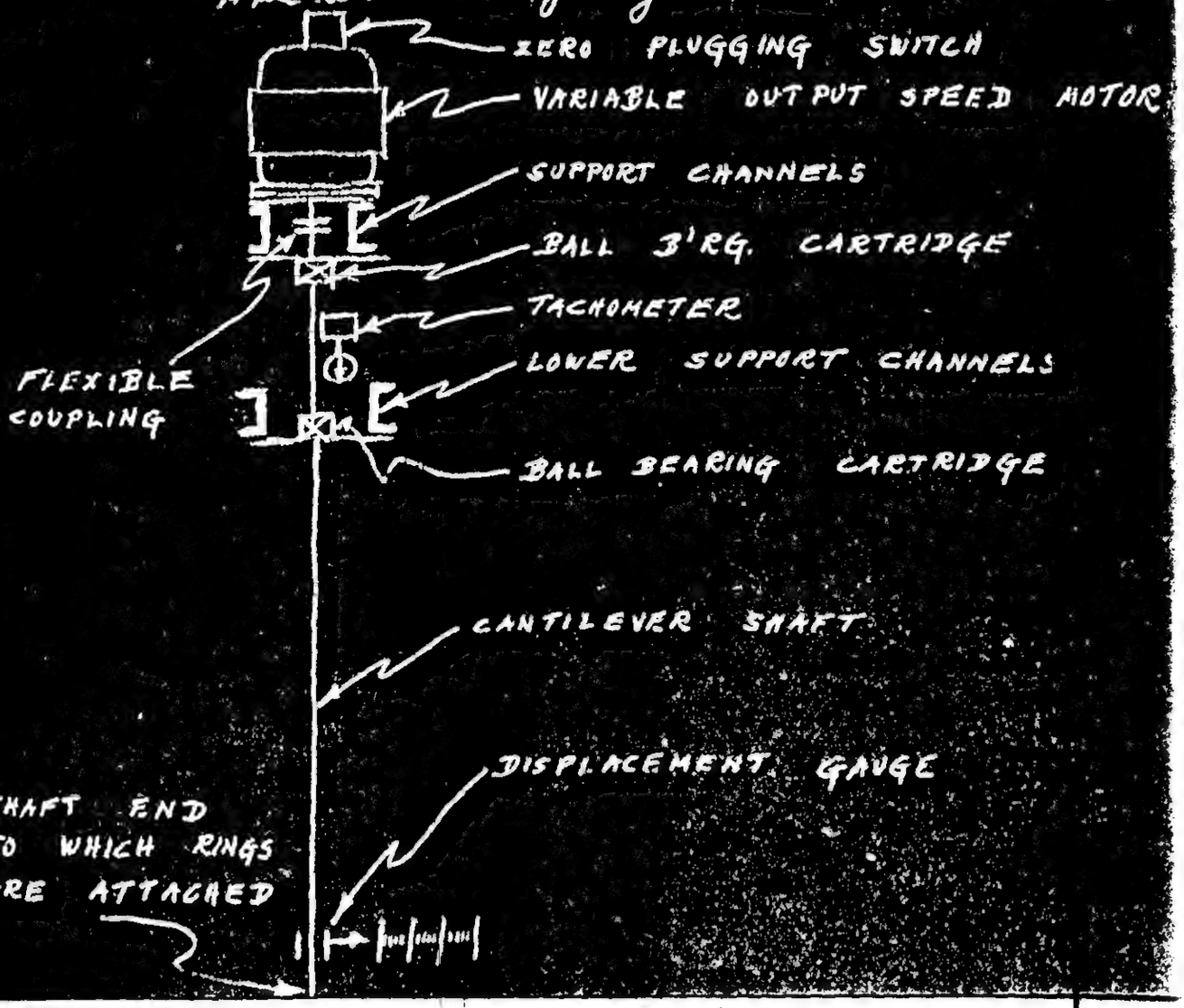
As to the composite plate as defined above, the adjacent longitudinal edges should be so finished off that tight, square fits between the plates are possible. In the case of clear plates, two sheets of ½" thk. polymethacrylate sheet should be employed encasing a "balancing" * sheet of clear cellophane should be used. [* Balancing here means balancing the filter Wratten color filter sheets used in the color filter plate.]. No bonding, as previously indicated, between the longitudinal plate joints will be necessary. Each plate made up as above outlined is to be independently attached to the appropriate End-Rings.

THE PRINCIPAL ASSEMBLY PROBLEMS:-

The proper operation of the Microscope as it is now projected depends on the following critical factors:-

I: THE PROPER BALANCING OF EACH OF THE END-RING UNITS:- Quite obviously at least two of the End-Rings [the L.H. End-Ring of the

Inner and Outer Drums] are not balanced as shown on Dwgs. 1-9. It goes without saying that a substantial order of 'dynamic balance' is demanded of all of the End-Rings. As a first step; each of the Rings should be brought to 'static balance' individually. Conventional procedures for the accomplishment of 'static balance' will suffice. After each Ring has been brought to 'static balance', a satisfactory method of testing for 'dynamic balance' and adjusting according to measurements determined thereby would be to use a device as generally outlined below:-



The apparatus sketchily indicated above would operate on the relationship between (E) – the eccentricity of the attached rotor, (W_N) – the natural frequency of the ~~loaded~~ Ring – loaded cantilever shaft assembly, (ω) – the angular velocity of the rotating assembly, and (y) – the linear displacement of the shaft due to the influence of (E). Of the above variables, (y) would be determined by the displacement gauge and (ω) by the tachometer. Since (W_N) is an analytically-computable property of any system in which the weight of the Ring, the shaft diameter, and weight of the shaft, and modulus of elasticity* of the shaft are known; it follows that an alignment chart of proper make-up would yield a value for E, the arm at which the rotor mass acts to induce the displacement of the shaft. The determination of any identical shaft velocity of the displacement following from the clamping of a known weight to any randomly-chosen but accurately determined point on the rim of any Ring would then permit the determination from a second alignment chart of the radial direction of the centrifugal force due to the rotor's mass acting at the previously determined eccentricity. The same second alignment chart could be set up to yield the point at which a balancing weight should be placed to yield a given order of balance at the test shaft velocity. A series of three, at most, such combined measurements, each followed by the appropriate attachment of balancing weights, —— with one test being performed at a low velocity, one test at an intermediate velocity, and the third at the full operating velocity of the Ring, would suffice to yield a properly balanced ring for incorporation in the Miniscope.

Yet the balancing of each of the Rings to a high tolerance would not necessarily mean the obtaining of a suitably balanced overall assembly

* tube elasticity

even if the method of attaching the slats and the distribution of mass amongst the slats were perfect, which admittedly is not a theoretically obtainable condition. Before the driving gear is located in its designated position, it would be necessary to test the unit for static balance. Once assured of, or corrected to, an adequate condition of static balance, the device in its assembled form would have to be mounted on a ~~spring supported~~ test table or frame, preferably a light frame (which is to say, a frame composed of light members). Using a vibrometer to measure the amplitude of the vibrations induced in the floor frame where the A-frames are tied in, it is possible to correct any assembly unbalance condition according to which of three classes of unbalance is determined to exist. These three conditions of unbalance can always be resolved to the operation of two centrifugal forces acting from the same side of the axis of rotation and in the same axial plane; or, two forces — acting in the same axial plane but from equidistant opposed arms as referred to the axis of rotation; or, two forces — capable of being resolved into a couple and one additional force — in the two forces act in different axial planes. In addition of compensating weights to ~~produce opposing~~ the Outer Drum End-Rings to produce opposing couples and/or forces then corrects the dynamic balance of the assembly. The balancing of the Periscope should be accomplished in two stages:- the first at Drum speed roughly ½ of the operating speed; and, the second at the full operating speed of the assembly.

II. - THE FITS BETWEEN CRITICAL MEMBERS OF THE ASSEMBLY:- To assist in this matter, a schedule of the required fits between various assembled members is given below:-

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 9/5/51

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent John M. Collins

Source from which obtained E.E. Thompson

Address Warden, Federal Detention Headquarters

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

153. Miscellaneous papers found in Brothman's cell after his removal to Atlanta.

(32)

100-95068-1B

8/12

BETWEEN	&	CLASS OF FIT
Plastic Commutator Ring Holder	~~Inboar~~ Bore of Main Drive Shaft	Friction Fit
Outer Race of 1⅛" shaft size bearing	Bore of the Pillow Block Housing	Snug Fit
Bore of the Inner Race of the 1⅛" shaft size bearing	Main Drive Shaft	Tight Fit
Output Shaft of the Motor Drive	Bore of the Inner Race of the Outboard Bearing	Snug Fit
Hub of the Outer Drum L.H. End-Ring	Bore of the Inner Race of the 1⅜" shaft size bearing	Tight Fit
Outer Race of the 1⅜" shaft size ball bearing	Bore of 1¾" pillow Block Housing	Snug Fit
Main Drive Shaft	Bore of the Bearing Mounting in the Hub of the Outer Drum L.H. End-Ring	Medium Fit
Main Drive Shaft	[illegible]	Wringing Fit
Stationary Shaft	[illegible] Bore of the Inner Race of the 1 13/16" shaft size ball bearing	Snug Fit (Medium
Outer Race of the 1 13/16" ball bearing in the Hub of the Inner Drum R.H. End-Ring	Bore of the Hub of the Inner Drum R.H. End-Ring	Tight Fit

BETWEEN	&	CLASS OF F
Stationary Shaft	Bore of the Inner Race of the 1 13/16" shaft size ball bearing in the hub of the Outer Drum R. H. End-Ring	Medium Force Fit
Outb Race of the 1 13/16" shaft size b.b. in the hub of the Outb Drum R. H. End-Ring	Bore of the Hub of the Outer Drum R. H. End-Ring	Tight Fit
Member (43) Dwg #1	Member (45) Dwg #1	Medium Fit
Member (46) Dwg #1	Member (45) Dwg #1	Free Fit
Member (66) Dwg #1	Axle Portion of Member (62) Dwg #1	Medium Fit
Member (53) Dwg #1	Shaft Member of the Latch Point Assembly - Dwg #1	Loose Fit

(1) Where the superscript (1) appears, attention is called to the fact that the fit should approach a "wringing or sticking fit"

(2) Where the superscript (2) appears, the specified "snug fit" should be a typical "snug fit"

(3) Where the superscript (3) appears, the specified "Tight Fit" should approach a "wringing" or "sticking" fit

(4) Where the superscript (4) appears, the specified "medium force fit" should approach a "tight fit"

* The ball bearing referred to here is in the hub of the Inner Drum R. H. End-Ring

BETWEEN	&	CLASS OF FI
Bearing Bushings	Bore of the Outer Drum L.H. End-Ring	Wringing Fit
Bearing Bushings	Bore of the Stationary Shaft	Wringing Fit
Hollow Shaft Member of the Tube Support Plate	Bores of the Bearing Bushings in the Stationary Shaft	Snug Fit (3)
Hollow Shaft Member of the Tube Support Assembly	Bore of the Hub of the Tube Support Bracket	Wringing Fit
Stationary Shaft	Hub of the "second support" anchor	Snug Fit (1)
Bore of the Driven Gear	Main Drive Shaft	Snug Fit (4)
Output Shaft of the Mot. Drive	Bearing Gear	Snug Fit (12)

Finally, as regards the Support Member of the Inner End-Ring (R.H.) and the Outer Drum End-Ring, R.H., care should be taken that each roller member is in solid contact over the whole rotation of these roller members with the inner surface of the rim of the Outer Drum End-Ring R.H. And as regards the Stationary Shaft in the Split Pillow Block, the latter must be drawn up rigidly tight against the Stationary Shaft by the capscrews fixing the two halves of the Split Pillow Block to be provided with lock-washers to prevent a loosening of the fixed Stationary Shaft.

III. A variety of assembly and operational factors, which will be discussed in the final section of this document under the collective heading of a "Syllabus of Casual Bugs, and Their Correction."

* * * * * * * * * * *

RE-CALCULATIONS CONCERNING THE SALIENT FEATURES OF THE DESIGN

THE SLATS

The larger diameter set of slats would have a radius of $24\frac{11}{16}$". The approximate area of each slat would be

$$\frac{2\pi(13)(60)(24\frac{11}{16})}{360} = 338 \text{ in}^2$$

and if each slat were $\frac{1}{16}$" thick the volume of each slat would be

$$\frac{338 \text{ in}^2}{16 \text{ in}^{-1}} = 21.1 \text{ in}^3$$

The specific gravity of polymethacrylate sheet is 1.1 and would have a weight of

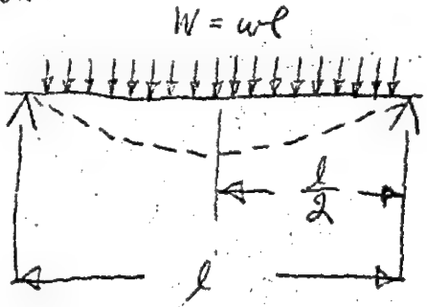
$$(1.1)(21.1 \text{ in}^3) = 0.902 \#$$

[illegible] slats [illegible] 24 rad ($\frac{3\pi \text{ rad}}{\text{sec}}$) = 130.8 rad/sec [illegible] acting on each slat would amount to

$$F_c = \frac{0.1962\ \#}{32\ \frac{ft.}{sec.^2}} \cdot (150.8)^2 \frac{rads.^2}{sec.^2} \left(\frac{13\ ins.}{12\ ins.} \frac{}{ft.}\right)$$

$$= 694\ \#$$

The force would be distributed as a uniform load over the entire length of the loaded beam to give a condition as schematically indicated below.



$$EI \frac{d^2y}{dx^2} = \frac{wx}{2}(l - x)$$

$$\frac{dy}{dx} = \frac{w}{2EI}\left(\frac{lx^2}{2} - \frac{x^3}{3}\right)$$

since $\frac{dy}{dx} = 0$, when $x = \frac{l}{2}$,

$$0 = \frac{w}{2EI}\left(\frac{l^3}{8} - \frac{l^3}{24}\right) + C_1$$

$$C_1 = -\frac{w}{2EI}\left(\frac{l^3}{12}\right) = -\frac{wl^3}{24EI}$$

whence :-

$$\frac{dy}{dx} = \frac{w}{2EI}\left[\frac{lx^2}{2} - \frac{x^3}{3} - \frac{l^3}{12}\right]$$

$$y = \frac{w}{2EI}\left[\frac{lx^3}{6} - \frac{x^4}{12} - \frac{l^3x}{12}\right] + C_2$$

since $y = 0$, when $x = 0$, then $C_2 = 0$; and,

$$y = y_{max}$$

when $\frac{l}{2} = x$, so that

$$y_{max} = \frac{w}{2EI}\left[\frac{l^4}{48} - \frac{l^4}{192} - \frac{l^4}{24}\right]$$

$$= -\frac{w}{2EI}\left[\frac{5l^4}{194}\right] = -\frac{5wl^4}{384EI} =$$

$$-\frac{5Wl^3}{384EI}$$

Reposing back to the diagram on Page 318, the dot on the y- indicates the center of gravity of the slat. The distance ($\bar{y}$) of th dot from the axis of rotation would be given by :-

$$\bar{y} = \frac{r \sin 30^\circ}{\text{rad } 30^\circ} = \frac{13\,(0.5)}{\frac{\pi}{6}} = \frac{13(3)}{3.14} = 1$$

The x-sectional area of the slat is approximately

$$\frac{2\pi r\ 60^\circ}{360^\circ} \cdot t = \frac{2\pi(13)1}{6\,(16)} = \frac{26\pi}{96} = 0.85$$

and its approximate (I_o) about its center-of-gravity is given by :-

$$0.852\,(13.00)^2 = I_o + 0.852\,(12.12)^2$$

$$0.852\,(13^2 - 12.12^2) = 0.852\,(169 - 154) = 12.78$$

where 13" is taken to be the radius of gyration of the slat about th x-axis thru the axis of rotation. By the equation derived on Page 31 then

$$y_{max} = \frac{5(694)(24\frac{11}{16})^3}{384\,(26)(10^6)(12.78)} = \frac{5(694)(15)(10^3)}{384\,(26)(10^6)(12.78)}$$

$$= 0.000408 \text{ in.}$$

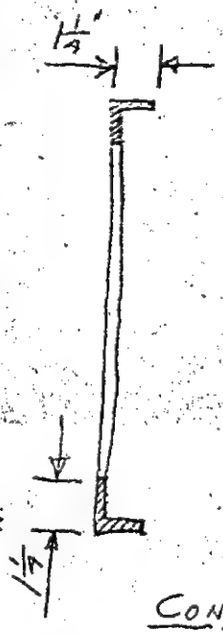
This is indeed a negligible deflection, but it ~~establishes~~ is based o the proper value for (E) — the (E) for steel — which is in all likelihoo large; but even if it were $\frac{1}{30}$ of the indicated value, then

$$0.000408(30) = 0.01224"$$

would be the approximate magnitude of (y_{max}). Even such a valu would be tolerated; and would evidently involve a very low stressing of the slat. If, as per Page 301, two sandwiching she of methalrylate were to be used, then

$$\frac{360}{60}(694)(2) = 8328\#$$

would be the total load imposed on the Outer Drum End-Pl by the slats when the Drum is rotated.



The stress induced in the End-ring would be a ben
stress. In fact, a 1¼" x ¼" x ⅛" aluminum alloy
is employed. The x-section of the angle offers an Ar
0.3 in.^{2}. This would mean that, since the load is c
between two Rings,

$$\frac{8328\ \#}{2(0.3)\ in.^2} = 13{,}880\ \#/in.^2$$

would be the tensile stress induced. This stress lies
atively beneath the elastic limit of such aluminums
515, and hence is acceptable.

CONCLUSIONS -- UP TO THIS POINT:-

A. The 60° slots, which are the weakest of the slots
the Outer Drum, will not suffer an undue
flection due to centrifugal loading during the
running of the Drum Assembly. If this is true of
slots in the Outer Drum, it certainly means that
slots in the Inner Drum are equally "safe."

B. The Outer Drum Rings, which were originally specifi
at 1¼" x 1¼" x 1/16" ∠s, but which in practice were
brought to 1¼" x 1¼" x ⅛" ∠s, are certainly safely
For the Inner Drum End-Rings which are ¾" x ¾" x
∠s, and which have a cross-sectional area of a
0.13 in.^{2}

$$\frac{8328}{2(0.13)} = 31{,}600\ \#/in.^2$$

would be the induced stress, which is still beneath
elastic limit for a 515 aluminum. Consequently,
Inner Drum Rings are also "safe". If the modulus
elasticity of the 515 is taken at $3.7(10^6)$ lbs/in.^{2}

$$E = \frac{S}{\epsilon} = 3.7(10^6) = \frac{31{,}600}{\epsilon}$$

$$\epsilon = \frac{31{,}600}{3.7(10^6)} = 0.00854$$

which is to say that

$$2\pi(13)(0.00854) = \text{peripheral stretch}$$

the sum = 0.696"

during rotation in the case of the Inner Drum E
If the increase in the circumference, (Δc), is 0.696
then

$$\frac{0.696}{6.28} = 0.11"$$

would be the increment in the radius of the wh
the moment we were to drop the restraining influen
spokes from consideration. Continuing the check,
bear that @ a loop stress of 13,800 #/in.^{2}

$$\frac{13,800}{31,600}(0.11) = 0.0481"$$

would be the radial stretch in the Outer Drum
Correcting the 0.696 circumferential stretch for the
of the Inner Drum Ring, which is 25½" instead of 2
find

$$\frac{25.5}{26}(0.696) = 0.684" = \Delta c$$

and

$$\frac{0.684}{2\pi} = \Delta r = 0.1088"$$

the Ring radius would go from 12.75"
12.75 + 0.1088 = 12.8588"
in case of the Inner Rings, while the Outer R
would go from 12.9375" to
12.9375 + 0.0481 = 12.9856"
gap between the Rings of
12.9856 - 12.8588 = 0.1268"
as opposed to the static gap
calculations are enough to indicate
of the radial stretch in the me

The stress in the Outer Rings due to their rotation is given by

$$T = \frac{w}{g} v^2$$

where:- w = the density of the ring-material (#/ft.^{3}); T = tensile stress, and, g = gravitational acceleration, ft./sec.^{2}. Where the sp. g. of [illegible] is 2.7, then

$$T = \frac{2.7(62.5)}{32} \cdot \left[(24 \text{ rps})(2\pi \text{ rads/rev})\left(\frac{13 \text{ ins}}{12 \frac{\text{ins.}}{\text{ft.}}}\right)\right]^2$$

$$= 140{,}000 \ \#/\text{ft.}^2$$

$$\doteq \frac{140{,}000 \frac{\#}{\text{ft.}^2}}{144 \frac{\text{ins.}^2}{\text{ft.}^2}} = 973 \frac{\#}{\text{in.}^2}$$

The combined tension stress in the Outer Rings due to their [illegible] and due to the imposed load from the slats would be

$$13{,}880 + 973 = 14{,}853 \frac{\#}{\text{in.}^2}$$

[illegible] would mean a radial stretch of

$$\frac{14{,}853}{3.7(10^6)} \times 13 = 0.0522"$$

[illegible] which are approximately 12" in length, a [illegible] would mean a unit elongation of

$$\frac{0.0522}{12} = 0.00496$$

$$3.7(10^6)(4.35)(10^{-3}) = 16{,}080 \ \#/\text{in.}^2$$

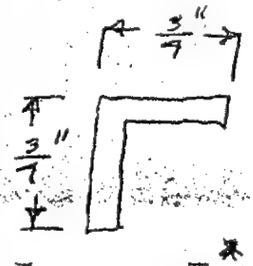
[illegible] stretch of the spokes would take place [illegible] of this stretch, for the four [illegible] fall in the rim. Between [illegible] the uniform loading of a [illegible] for the 1½" x 10½" x [illegible] is 0.5 in.^{2}, a stress

a stress of 14,853 lbs./in.^{2} means a load of

$$14{,}853(0.3) = 4455.9\ \#/\text{ring}$$

Per spoke, this would mean

$$\frac{4456}{4} = 1114\ \#$$



or a stress of

$$\frac{1114}{\frac{11}{64}} = 6500\ \text{psi}$$

$\frac{5}{8} \times \frac{1}{8} = \frac{5}{64}$ in.^{2} *

$\frac{6}{8} \times \frac{1}{8} = \frac{6}{64}$ ins.^{2}

$\frac{11}{64}$ ins.^{2}

and, for a spoke length of approx. 12", the ar to:

$$\frac{6500}{3.7(10^6)} \cdot 12 = 0.0211'' = \Delta l$$

For a uniformly-loaded beam with fixed ends, (y_{max}) [de not shown here] would be given by:-

$$y_{max} = \frac{Wl^3}{384\,EI}$$

(l) may be taken to be $\frac{1}{4}$ x the circumference, whence

$$\frac{13(2\pi)}{4} = 20.4'' = l$$

and, since I, for a $1\frac{1}{4}'' \times 1\frac{1}{4}'' \times \frac{1}{8}''$ ∠ is 0.04 in.^{4}, the

$$y_{max} = \frac{1114(20.4)^3}{384(3.7)(10^6)(0.04)} = 0.2335''$$

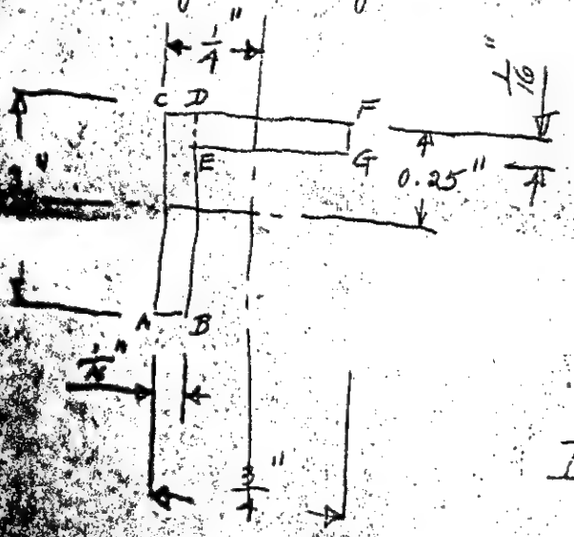
~~0.467~~

This indicates that a doubling of the number of spokes already specified would be required to hold the between-~~spokes~~ deflection of the rim to tolerable limits. Such a doubling of the no. of spokes used would halve the load per span, and halve the span —— the combined effect of which would be to cut the between-spokes deflection to $\frac{1}{16}$ of the value computed above:- or

$$\frac{0.2335}{16} = 0.0146''$$

~~0.467~~ ~~0.0292~~

In the case of the Inner Barge, only part of the solution to the prob
of preventing a large between-spokes deflection like in doubling
no. of spokes, for the moment of inertia of the angle section is



The moment of inertia of $\overline{ABCD}$ abo
own neutral fibre would be :-

$$\frac{1}{12} \cdot \frac{1}{16} \cdot \left(\frac{3}{4}\right)^3 = \frac{0.42}{192} = 0.$$

About the indicated X-axis the
moment of inertia of this section
be

$$I_x = 0.00219 + \frac{1}{16} \cdot \frac{3}{4} \cdot \left(\frac{1}{8}\right)^2$$

$$= 0.00219 + \overset{0.00073}{\cancel{0.00586}}$$

$$= \overset{0.00292}{\cancel{0.00805}} \text{ in.}^4$$

oment of inertia of $\overline{EDFG}$ about its neutral fibre woul

$$\frac{1}{12} \cdot \frac{3}{4} \cdot \left(\frac{1}{16}\right)^3 = \frac{3}{78(4100)} = 0.0000153 \text{ in.}^4$$

dicated X-axis would be approximately

$$= 0.0000153 + \frac{3}{4} \cdot \frac{1}{16} \cdot \left(\frac{1}{4}\right)^2$$

$$= 0.0000153 + 0.00293$$

$$= 0.00295 \text{ in.}^4$$

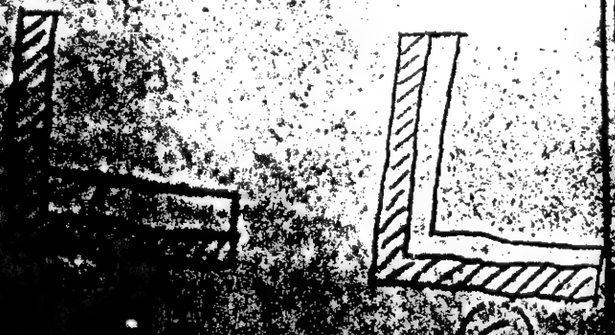
ll (I_x) of approximately $0.0058\overline{7}$ in.^{4}
Inertia of the angle section would i
spoke flexure. Roughly it would am

$$= 1.555"$$

$$\frac{\alpha\, 1.555}{16} = 0.091''$$

for an 8-spoke wheel. Before proceeding the "8-spoke fo
to a conclusion, and before proposing a solution for the exc
"between-spokes" flexure of the Inner Drum End-Rings, it
pay to give attention to the problem which arises because of t
the loading of the centrifugal force acting on the plate to ou
of the 4 rims. A situation such as is indicated below

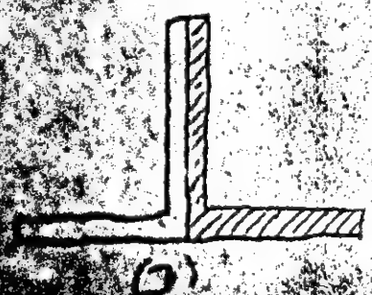
In other words, a tendency would exist
loaded leg to flare out due to a cont
of the loading. This would be most noticeab
the case of the Outer Drum L.H. End-Ring
3/16in, in the next instance, in the case of
Outer Drum R.H. End-Ring. It would
applicable to the Inner Drum End-Rings. (
the load involved is such that if it were
over any single portion of a 1¼" × ¼" × 5
an excessive deformation of the concentrated-
Tension stresses are concerned, there is but
and that is to increase the area of
is indicated some of the way in which t



* * * * * * * * *

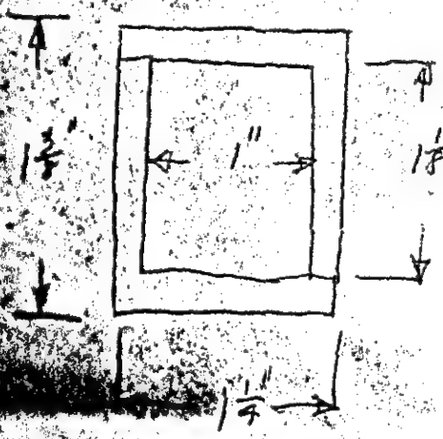
(In each case, the x-hatched mem
as the presently-specified 7-mm)

* * * * * * * * *



(D)

From purely structural considerations, (A) a
(D) provide the soundest means of "befin
up the stressed section. From a cost
(B) and (C), and particularly (B), stand better.
(B) and (C) involve the greatest re-design of the later
— in that for the given stroke of the "pertinere'
any increase in the metal thickness of the leg there wo
plunger go means a decrease in the displacement
the latch-pawl can be pushed. Though it would
that this is true for (A) as well, certain accom
be made with (A) which are not so easily
there.
working towards a final solution of the problems
comments on (A), and for the moment
the slate consisting of a sandwic
A section thro
area of 0.6". The (I) for this sec



would be :-

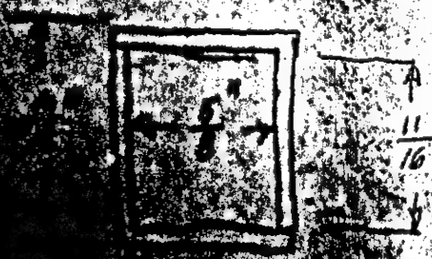
$$I = \frac{1.25(1.375)^3 - 1(1\tfrac{1}{8})^3}{12} =$$

$$= \frac{3.25 - 1.42}{12} = 0.1525 \text{ in}$$

Accordingly, the deflection of 0.0146" on Page 329 would now assume a value of

$$\frac{0.0146(0.04)}{0.1525} = 0.00383"$$

The (I) value for a similarly treated Inner Drum End Ring would be



$$I = \frac{\frac{3}{4}\left(\frac{13}{16}\right)^3 - \frac{5}{8}\left(\frac{11}{16}\right)}{12}$$

$$= \frac{\frac{3}{4}(0.532) - \frac{5}{8}(0.323)}{12}$$

$$= \frac{0.399 - 0.202}{12} = 0.0164 \text{ in}$$

And, similar to the case of the Outer Drum End Ring, a deflection of 0.091" given on Page 326 would now assume a value of

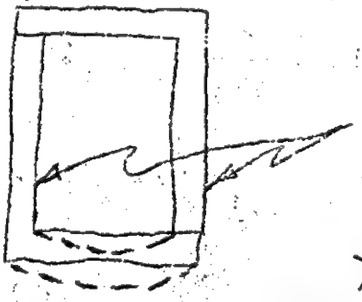
$$\frac{.091(0.006)}{164} = 0.0333"$$

and the spring rate would be 1455.9 #/in.

$$y_{max} = \frac{54.5\left(\frac{5}{8}\right)^3(12)}{192(5.7)(10^6)\left(\frac{1}{16}\right)^3} =$$

$$\frac{54.5(0.293)(12)}{192(3.7)(10^6)(.293)(10^{-6})} = 0.000\,922''$$

be the probable order of the deflection of the loaded side of the bo
for the case of the box formed by the two $\frac{3}{4}'' \times \frac{3}{4}'' \times \frac{1}{16}''$ $\angle$s
the beam formed by the bottom is held to have an $(h) = \frac{1}{2}''$, a (b
and the so-formed beam is held to be one having its ends fixed.
were the order of the flexure due to the plate in motion, or even if it
several multiples of the indicated value, then the danger of a condi
such as is indicated below :-



A SEVERE DEFLECTION OF
BOTTOM PANEL OF THE BOX
MEAN A DRAWING IN OF
SIDE(S) TO WHICH THE ARR
POINTS

developing until a collapsing of the beam occurs is indeed pos

Thus, it is possible to sum up the major aspects of this
section by stating that the structural stability of the beam a
under dynamic conditions demands that :-

1) the $1\frac{1}{4}'' \times 1\frac{1}{4}'' \times \frac{1}{8}''$ $\angle$ rims be converted
from an angle section of the indicated dimen
to a box-section with an $h = 1\frac{3}{5}''$ and a
$b = 1\frac{1}{4}''$ by properly joining two $\angle$s of the indic
specifications

2) the $\frac{3}{4}'' \times \frac{3}{4}'' \times \frac{1}{16}''$ $\angle$ rims be converted from
an angle section of the indicated dimensions to a
box-section with an $h = \frac{12}{16}''$ and a $b = \frac{3}{4}''$
by properly joining two $\angle$s of the indicated specif

and,

3) each End-Ring should be converted from a 4-spo
ring to an 8-spoke ring

Having thus assured ourselves of the structural correctness o
stability of the Drum Assembly as such, we may now pass to a
consideration of the associated mechanisms.

Firstly, let us obtain an approximation of the weights
the two Outer Drum End-Rings and the two Inner Drum End
Rings :-

A steel ∠ $1\frac{1}{4}" \times 1\frac{1}{4}" \times \frac{1}{8}"$ would weigh 1.01 #/ft. The
of iron is 7.67, and that of aluminum 2.7. This means, on
basis of a 13" O.R box-section, a weight of

$$\frac{2(1.01)\,2\pi\,(13)(2.7)}{7.67\,(12)} = \frac{566}{13} = 4.71\ \#$$

for each of the Outer Drum End-Rings. The x-sectional area
a $\frac{3}{4}" \times \frac{3}{4}" \times \frac{1}{16}"$ ∠ is (Page 321) 0.13 in.^{2} as compared
a 0.3 in.^{2} for a $1\frac{1}{4}" \times 1\frac{1}{4}" \times \frac{1}{8}"$ ∠. Thus, the box section
formed as per above from the $\frac{3}{4}" \times \frac{3}{4}" \times \frac{1}{16}"$ ∠s would weigh
approximately

$$\frac{0.13}{0.3}(4.71) = 2.04\ \#$$

for each of the Inner Drum Rings. This would give a total
wt. of

$$2(4.71) + 2(2.04) = 9.42 + 4.08 = 13.5\ \#$$

for the end-ring assemblies. To include the mechanisms
ing onto the various End-Rings, it would be a fair estimate
add on another 2.5 #, raising the total weight to 16 #.

Basing ourselves on a sandwich formation for the slats
2 sheets of $\frac{1}{16}"$ thk. polymethacrylate sheet holding between them

the filler sheet), it is clear by Page 316 that if one 60° s... weighs 0.902# for one 1/16" thk. sheet, then the weight of ... methacrylate on each Drum would be of the order of

$$\frac{0.902(360)(2)}{60} = 10.824\ \#$$

giving a total of 21.648# for both Drums. Approximating the weight of the Ribs and the plate to act from a 13" radius, the...

$$\left[\frac{21.65+16}{32}\right]\left(\frac{13}{12}\right)^2 = \sum m r_z^2 = 1.382\ \#\text{-sec}$$

Consider all of the spokes to be 13" lg., and fabricated from 3/4" ... 4. There are 8 spokes per wheel, and 4 wheels to take into ... This means

$$\frac{32(13)}{12} = 34.6'$$

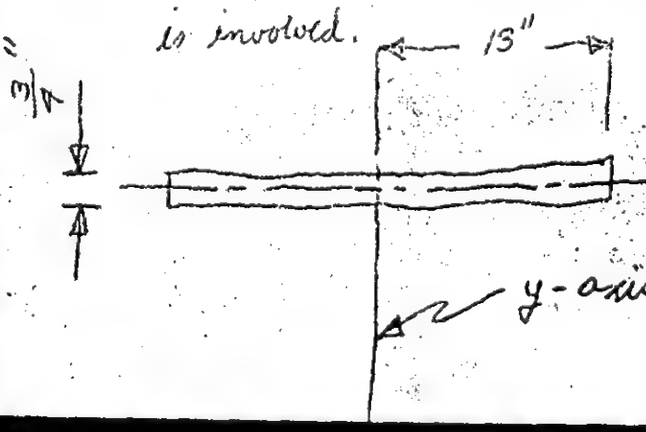
of 3/4" x 3/4" x 1/8" ∠ involved. If as per Page 321, a 3/4" x 3/4" ... angle has a x-sectional area of 0.13 in.², then a 3/4" x 3/4" ... ∠ would have approximately 0.26 in.² of x-sectional area ... which would mean

$$\frac{34.6(0.26)}{144} = 0.0625\ \text{ft.}^3 \text{ of aluminum}$$

is involved. This would mean a weight of

$$0.0625(62.5)(2.7) = 10.55\ \#$$

is involved.



Consider this 10.55# weight to be represented by a single bar 32" lg. and 3/4" wide, about the origin of indicated set of coor...

The (mr^2) about the x-axis would be

$$\frac{10.55}{32(12)}\left(\frac{\frac{3}{4}}{12}\right)^2 = \frac{10.55}{32(12)}\cdot 3.9(10^{-4}) =$$

$$1.08 \times 10^{-5} \text{ lbs.-ft.-secs.}$$

The (mr^2) about the y-axis would be:-

$$\frac{10.55}{32(12)}\cdot\left(\frac{26}{12}\right)^2 = \frac{10.55\,(4.7)}{32(12)} =$$

$$1.29(10^{-1}) \text{ lbs.-ft.-secs.}^2$$

Since

$$I_p = I_x + I_y$$
$$= 1.08 \times 10^{-5} + 1.29(10^{-1})$$
$$\doteq 1.29(10^{-1}) \text{ lbs.-ft.-sec.}^2$$

Thus, the Drum Assembly would have a total inertia of

$$1.382 + 1.29(10^{-1}) = 1.511 \text{ lb.-ft.-}$$

Then, the energy that must be assigned to the Drum in getti
it up to a speed of 150.8 rads./sec. would be

$$\frac{1}{2}\cdot 1.511(150.8)^2 = \frac{1,511(22700)}{2} = 17,200$$

which, if done in 60 secs., would amount to:-

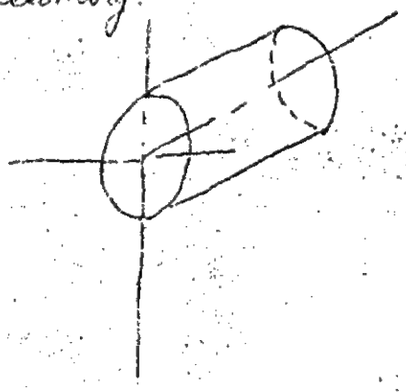
$$\frac{17,200}{60} = 284.4 \text{ ft-lbs./sec.}$$

Start-up in 60 secs. would thus demand a

$$\frac{284.4}{550} = 0.518 \text{ HP motor driver}$$

This size of motor demanded here for start-up alone raises the
of a reconsideration of the sandwich formation of the plate
reduce the weight involved.

But before we consider a change in the design of the plate, we enter into the question of the power demand of the against the air fluid that fills the cabinet. The power power load is due to the centrifugal fan action of the Dr assembly.



The fan action would occur pri at the end-faces of the rotor, wi cylindrical portion of the Drum a comparatively small contribu fan action. By a derivation indicated here, the fan effe of the end-faces would vary as the 5th power of the of the rotor, while the influence rotor length would be as the of Drum length

By the writer's understanding, a 22" diameter rotor, 1/16 called for a 1/20 HP motor driver. Then,

$$0.05\left[\frac{26}{22}\right]^5\left(\frac{24}{16}\right)^{0.3} = 0.05(2.3)(384)$$

$$= 0.05(2.31)(5.95) = 0.688 \text{ HP}$$

would be the size of unit required to power the instant d if we assume that the 1/20 HP motor was 75% loaded, then

$$0.75(0.688) = 0.516 \text{ HP}$$

would be the actual power-demand here. It would then a a 3/4 HP motor would be required.

Next, the question of braking the mechanism arises. If the Drum Assembly is 1.5 lb.-ft-secs. and the D is to be brought to rest in about 6 secs., a negative accele

$$\frac{150.8(2)}{60} = 5 \text{ rads./sec.}^2$$

is needed, and this would require an applied torque of

$$1.511(5) = 7.555 \text{ ft-lbs.}$$

Basing ourselves on the Eddy Current Brake already described, the designed Brake at its feed of 25 milliamps would exert a torque of

$$0.1772(25)(1) = 4.44 \text{ ft.-lbs}$$

at the peak velocity of the Drum; and, at $(\frac{1}{25})$ of the starting running velocity of the Drum would exert

$$0.1772(1) = 0.1772 \text{ ft.-lbs.}$$

Thus between an angular velocity of 150.8 rads. /sec. and

$$\frac{150.8}{25} = 6.03 \text{ rads. /sec.}$$

the designed Eddy Current Brake would exert an average torque of

$$\frac{4.44 + 0.1772}{2} = 2.31 \text{ ft-lbs.}$$

which means that

$$\frac{2.31}{1.511} = 1.528 \text{ rads. /sec.}^2 = \text{the yielded}$$

negative acceleration, and

$$\frac{150.8 - 6.03}{1.528} = 94.4 \text{ secs.}$$

of braking-time would be required to go from 150.8 rads. /se
6 radians /sec. Thus, a slight re-design of the Eddy Current Br
to provide for a higher permissible current feed-rate through
bring the speed-control Brake at its over-excited condition
into effective use as the Brake for slowing down the drum i
switching to black-and-white viewing.

One important question in viewing the braking problem, towa
attaining a speed suitable for Plunger "A" to go home, is the
question of how much energy the plunger-member of Position "A"
can absorb.

$$y_{max} = \frac{WL^3}{3EI}$$

defines (y_{max}) for a cantilever beam, which is what the plunger [Item # 45, DWG. #1] is:-

$$y_{max} = \frac{Wl^3}{3EI} = \frac{(Wl)l^2}{3EI} = \frac{Ml^2}{3EI} = \frac{\frac{I}{c}l^2}{3EI}$$

$$= \frac{5l^2}{3Ec} = y_{max} = \frac{25l^2}{3Ed}$$

Since $l = 1.5"$, if we specify a limiting stress of 20,000 psi,

$$y_{max} = \frac{2(20,000)(1.5)^2}{3(26)(10^6)(\frac{5}{16})}$$

$$= \frac{2(20,000)(2.25)(16)}{3(26)(10^6)5} = 0.0037"$$

and now by

$$y_{max} = \frac{Wl^3}{3EI}$$

$$0.0037 = \frac{W(1.5)^3}{3(26)(10^6)\frac{\pi}{64}(\frac{5}{16})^4}$$

$$\frac{0.0037(3)(26)(16^4)(\pi)(0.0095)}{3.37} = W = 2560\#$$

which is to say that since the stored elastic energy would be given by

$$E_E = W\frac{y}{2}$$

then

$$2560(0.0037) = 9.46 \text{ in-lbs.}$$

would be the energy which safely be stored in the plunger-mass Position "A". Thus, the maximum speed from which the plunger could act would be

$$\frac{9.46}{12} = \frac{1.511\,w^2}{2}$$

$$\left[\frac{2(9.46)}{12(1.511)}\right]^{1/2} = w = 1.04 \text{ rad/sec}$$

Actually, the above calculation, despite its optimistic reflections on
problem, yields a deceptive result. The force between the drill-hol
float "A" and the plunger of Positioner "A" which would be invo
is impractical. We will return to a consideration of the pr

If we assume the use of a $\frac{1}{4}$ HP motor and assume it
under starting conditions, it will give 25%, on the average,
its full-load output torque, then

$$\frac{0.75(6302.5)}{1725} = 27.4 \text{ in.-lbs.}$$

or

$$\frac{27.4}{12} = 2.28 \text{ ft.-lbs}$$

would be applied to the acceleration of the drum. Here

$$\frac{2.25}{1.511} = 1.508 \text{ rads./sec.}^2$$

would be the initial acceleration. To travel one full revolution
the required, starting from rest,

$$2\pi = \frac{1}{2}(1.508)t^2$$

$$\left[\frac{4\pi}{1.508}\right]^{1/2} = t = 2.88 \text{ secs.}$$

At which time the Drum Assembly would be moving at a
velocity $\frac{1}{2}(2.88)(1.508) = 2.17$ rads./sec.
velocity as indicated above and which Positione
to have all this rate, it will clearly be seen that whe
Drum itself is driven by the Drive motor in a slow
the load imposed on the Latch-pawl in lowering pos
is substantial. This calls for a re-evaluation of the
to be used operating Positioner "A" and in

(A)

THE MIRIASCOPE

2 A.M.
5/27/51

Regarding:-

1. Re synchronization system:- Conditions now make it look as if I will have to leave the detailing of the scheme outlined in "Drive Motor Arrangements" to you. I believe that the ideas were outlined with sufficient clarity to enable a competent servo-engineer to proceed with this. Re calculations in "Drive Motor Arrangements" in view of the comments re motor size below hold only as an outline. All indications are that the same magnetic structures that operate the mechanism can be temporarily over-excited when braking for the black-and-white realignment of the Drums. This would eliminate the brute reduction which the solenoid-operated brake provides. Re calculations on Page 316 thru 336 indicate that a "clotting out" of the tube which normally feeds the magnetic structures in synchronization control, and a substitution of a source capable of feeding possibly 50 milliamps would provide braking in a reasonable time (estimated 1 minute).

(torque control)

2. Re Drive Motor:- Re calculations on Pages 316 thru 336 indicate that the motor-size was slightly underestimated in the original calculations, and that a motor of 3/4 HP size is required. The breaking factor here is the "fan load" on the motor, rather than start-up energy. In computing the "fan load" the basic relationships I have used are correct (such as the influence of rotor diameter and cylinder length on the power required), but the estimate that a 1/20 HP motor is 75% loaded with a 22" disc of 1/2" thickness is just an estimate. Therefore the

(EE) Page 316 Section marked IMPORTANT

before the size of the Drive Motor should be decided upon
the more precise information you must have. It is poss
a substantially smaller motor would suffice.

3. The gearing — the recent change in the gearing that
drives the Main Drive shaft was in accomodation to
the newly-received synchronization method. This will
seen from Page 6 of "Drive Motor Arrangements" and
based on a 1725 rpm full-load motor speed. It is
assumed that constant speed service for the motor would
established around the 1725 rpm full-load speed. Ch
here in this matter are left up to you. But there
must be lived up to here in connection with the gear
and that is the use of an Oil Reservoir or Oil bath
right-angle transmission. Helical gearing is to be used
general, in all right angle gear transmissions, a great
of rubbing action between the gear teeth is involved, and
the proposed partially-filled Oil Bath (with one gear w
thru the oil layer) provides for the long-life of the gear
involved.

4. The functioning of Positioner "A" and realignment operation
The calculations on Pages 318 thru 336 indicate that
firing Positioner "A" cat action at speeds more than
first a few rpm would be to impose excessive loads on the
ram or plunger portion of the Positioner as it would cause
the pin and the rim of the drill-hole of the
finally leading to a considerable friction between these
Moreover, it would seem that the use of Da
involved for overdriving the Drive Motor
shaft up to speed in realignment operati
the shock loads on the latter pa
be involved. Therefore, my suggestion

(Cc

would be to :- a) bring the Drum Assembly to rest by
positioning the Drum Assembly as a whole thru Positioner
and, (b) in starting the Drum Assembly again preparatory to
operating Positioner "A", to start the motor thru a high
resistance that would reduce the applied voltage to the motor
a very low level — a level such that the motor would
or weakly move the Drum. The same practice as regard
the application of less than full voltage to the motor would
to all re-alignment operations in which the Inner Drum is mov
by itself. Some changes in the Control Circuit would be neces
by this scheme, and taking this in combination with the
of using a temporarily over-excited Eddy Current Brake
the Hoking unit in ~~black & white~~ going to black-to
with alignment from color operation, would pr
following suggestion :-

operating coil of

Positioner "A"

a) using an early version of the Ellinco D.C. Stere
the homodyne it would be possible to get a "start
signal from the Prism Assembly. The signal be
in the form of the absence of a blocking signal t
tube (across a plate circuit relay. Each time
would actuate the Jacobsen relay C3. The
de-energization of the plate circuit relay could relay
signal from the black-and-white position of the
selector switch C2 to the timing relay now cont
the application of the motor phase signal to the
via C9, C10 and by another set of contacts
circuit relay, power supply from the blu
position of C2 to a conventional relay
stop-out of the tube normally feeding the
use of the auxiliary power source for over-
tube could be terminated. Then the stab
motor power from "run" to the positioner
"A" would be removed immediately after the A
has been brought to rest and the brake he
energized.

b) The feeding of the power signal to the moto
indexed, as stated in C9, C10, and C12 would
each of these cases pass through the same
unit to control the applied voltage and
torque from the drive motor, while
C11, a three-way supply for the regular rotor
operation of the rotor would be applied
the motor. In the C11 full voltage energi

rotor

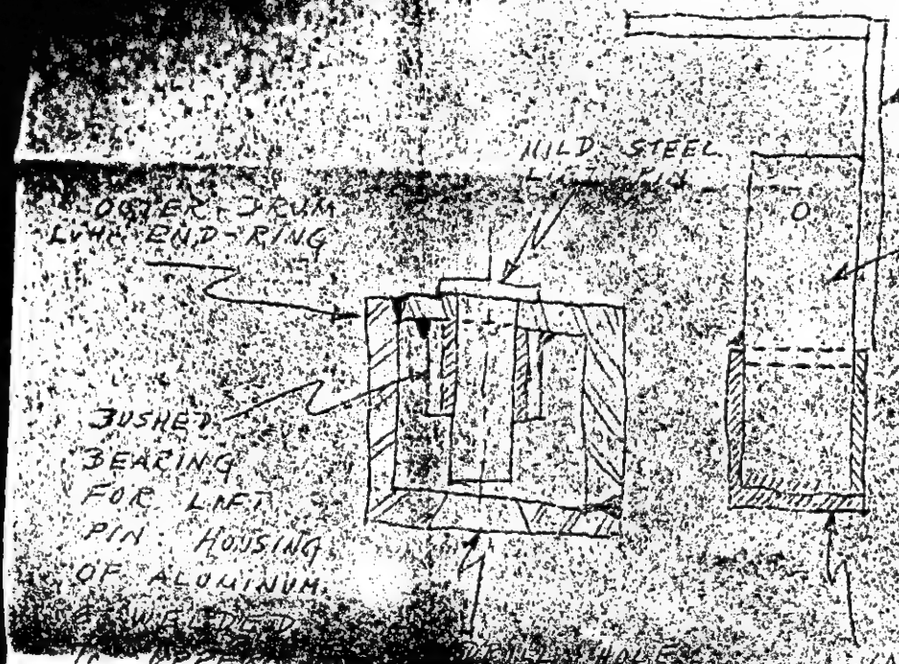
As noted, the functional patter of the control circuit change out in that done "A" is after the has brought the rest

c) The formulation of the plat
fabrication of the plate, and suggests a sandwich
Page 310 comments on the
would be two sheets of polymethacrylate form an
layer supporting a filter film
be obtained from a single sheet
gelatin can be applied. The
the standpoint of many considerations

any method of obtaining adequate filter action by the use of a single methacrylate sheet for each slot should be used. But regardless of the slot formation method used, the polymethacrylate sheet dimensions should be kept as now indicated.

2. The number of filter areas within each slot might be doubled to give what fundamentally is a four-color (4 sets of three) system instead of a 6-color (2 sets of three) system to enable a halving of the drum speed as previously suggested from you. The use of clear methacrylate sheet in the base of the slot adjacent makes such a modification possible. The filter-meeting areas merely applied media to a clear sheet. Since the drum speed required by the present specification is the cube of the drum speed, a cutting of the present requirement to one-eighth of the present computed level would be made possible as regards the motor power requirements of the drum assembly. The start-up energy requirement for the same starting time would be cut to one-fourth of the present requirement. Thus it would be possible to use a ¼ HP Drive Motor.

6. The End Rings — As shown in the calculations on Page 31 & 32 of the write-up, the End Rings should be modified with a complementary ⅓ of the same dimensions as the present specified ⅔ to form a box-section ring with a base of 1½" and a height of 1⅜". The Drum Shell should be similarly modified to a base of 1½" and a height of ⅞". This would result in a considerable saving in weight from the present specification.



The modifications which the box construction will require in the mounting of the latch pawl, dead and support [illegible] mechanisms are illustrated above. A lift per connects between the [illegible] plunger member of the Position [illegible] and the same lift per connection appears in connection with [illegible]

of the box section. The essential geometric relationships are
in each case kept unaltered from those shown on page
Naturally, the support members will now slide on the fixed
the Outer Race & Ball Ring. In construction, the Ball Race
be spot-welded at the points to be maintained free from
Dwgs 1-5. In sections below the mounting of the box
a telescoping of a portion of one leg of a spoke X, the
The basic construction as per Dwgs. 1-8 are to be set up
the appropriate support panels for the support members, which
etc. set in place on the previously drawn X, and the
co-planar legs & suitably notched for the support panels) are
be welded on to complete the enveloped box section
the two sides to each other to form the box angle members
be in the form of continuous welds except as shown
towards easier balancing of the final Ring. Through the
sectional modification was completed at the higher velocity
upon and is of less critical modification at the upper
would do well to maintain it at the lower speed. H
8-spoke construction is mandatory at both speeds. For
it is stated that all members previously mounted on the
top sides of the former specified X arms are now to be mounted
on or with the top panels of the new enveloped
sections. The same geometric relationships between
tolerances are to be maintained.

Where spacers, specified now upon the
Sections "A" and "B" [illegible]
[illegible] agreement of the [illegible]
[illegible] Brake [illegible]
[illegible] by [illegible]

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 2/20/52

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent J. M. Collins

Source from which obtained See Serial 768

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retained

List of contents:

154. Photostatic copy of the letter written by Brothman to the Reverend B.B. Nielsen, 4th Avenue, and 46th Street, Brooklyn, N.Y. whom Brothman classified as a friend.

(82)
100-95068-1B

NUMBER 7647

NAME ABRAHAM BROTHMAN

If written for one inmate by another enter name and number of the actual writer in space below:

WRITTEN BY

NUMBER

Inmate's name and number must be signed at the bottom of this letter and correspond with that on this coupon.

NOTE: Do not write on reverse side of this coupon.

Letter sent to Following Address: :

NAME [illegible]

Street and Number [illegible]

City [illegible] State [illegible]

Relationship [illegible]

DO NOT WRITE BELOW THIS LINE

Last Letter to Same Address

Total Number to Same Address

FPI—LK—11-2-50—1,100M—7605

From ABRAHAM BROTHMAN

PMB 7647, SING SING, N.Y.

To REV. ELT NIELSEN

(Name)

[illegible]

(Date)

[illegible]

(Address)

Dear Bjorn,

I have your letters of Dec. 25 and Jan. 1, and as always those letters have brought [illegible] the warmth, the loving kindness, and in general the wonderful spirit that I have come [illegible] with you. And nothing comes more welcome here than these good and human qualities! [illegible] and 'person' and not just 'good' ones, because anything like these qualities in [illegible] less than 'human', something more [illegible] to be associated with the lower species.]

I'm reminded of what the word 'human' has always meant to me whenever in the [illegible] as happened tonight, a sheet of paper entitled "Notice of Action of Parole Board" chanced to come [illegible] Stripped of verbiage, as you might surmise, in a single word:- "Denied", but, as is so often the case, what the high and the mighty would dismiss with a single word, it never quite gets away with that easily. For every contemporaneous verdict, it must be borne in mind, there will also be a later and later decision, and that later decision belongs to history; and I'm confident that history will be with me.

But it nevertheless never fails, when I look at that peremptory "Denied", to evoke a whole train [illegible] for it is no light matter to be told that your freedom is "Denied". I desired freedom, but, as I [illegible] and mightily found out a little more than a year ago, I place it cheaper than my right to [illegible] history. My initial application to the Parole Board and what I had to say in my personal appearance [illegible] Parole Judge made this clear, for as accurately as I can recall both, my written and [illegible] I stated that [illegible] for [illegible] for the earliest termination of a manifest injustice." And then I went on to say that the only [illegible] able motive for the alleged crime had to be a guilty association with espionage, and nothing [illegible] be more ludicrous than such an accusation for neither the Brothman that people knew in person [illegible] the one they knew thru his writings could conceivably have been a trafficker in "secrets". On the [illegible] contrary, I insisted, mine had been a record of a ruthless opposition to the penetration of [illegible] magic and wizardry into science; and, moreover, I argued, I had always felt that the obligation [illegible] the scientist to make his work publicly known stands as a higher calling than any other [illegible]

think of, having none. No proof required by such a point, and I offered more than
reprints of published articles to substantiate my claim to this viewpoint, could prove, I was in
in "cloak and dagger" escapades to pilfer "secrets", nor could he have become the accomplice
who found in such endeavors a satisfaction which outweighed their judgment or [illegible]

So "Denied" is the verdict on my request to serve at the earliest possible [illegible]
location of my choice! "Denied" is the verdict on my openly announced intention of [illegible]
service"! "Denied" is the verdict on my contention that my return to society is at best and
with the best interests of society as they found the application of Japanese and German war criminals
be! And "Denied" is the verdict on my children's oft-repeated request that their [illegible]
home!

There is a place reserved in Hell for the champions of democracy and [illegible]
of concentration camps for the suppression of those who [illegible]
society. The verdict; and I [illegible]
ing the fact, it does seem rather disturbing to me that it is considered [illegible]
be "Denied" when we ask for it! And to add insult to injury, it was denied
negligible part, if record by the Nation's Courts of Justice. And moreover, when the "[illegible]
which they have handed me is their certificate of infallibility to the men of history [illegible]
appearance, the one which will [illegible] the verdict of those who [illegible]
to its proper place — to the [illegible] freedom and justice!

I know that their "Denied" will [illegible] by knowledge of what [illegible]
I cannot believe, for it is [illegible]
will be the feeling of [illegible]
[illegible]
[illegible]
[illegible]
photo of my children in which [illegible]

The day after I wrote [illegible] I sat down [illegible]
statements in that [illegible] "Denied" [illegible]
like that. Days [illegible]
I look forward [illegible]

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 3/10/52

ABRAHAM BROTHMAN

100-95068-1B

(Title of case)

Submitted by Special Agent J. M. Collins

Source from which obained See serial 769

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

155. Photostatic copy of a letter to Abraham Brothman from his wife Naomi.

156. Photostatic copy of a letter to Naomi Brothman from her husband Abraham Brothman.

(84)

100-95068-1B

To: Abraham Brothman #71647
From: Naomi Brothman, 41-08-42 St. LIC

Feb. 13th
Wednesday

Dear Abe:

Have had no letters from you this week but what with the Holiday yesterday and the general delay this is not surprising at all. Will probably get one tomorrow.

Saw yesterday the play I wrote you before. Was greatly impressed by it this time, even more than before. I have completely forgotten what it was all about but found it even more timely now than before. I wonder if you remember it though I am sure that you do. You have such a good memory. They have changed the play somewhat but the punch is the same. By the way the part of the inquisitive boy, played formerly by our neighbor, is now played by a girl. I guess it was easier to get a girl than a boy to do this small but good part.

It has gotten very cold here again and it looks like I have caught something of a cold. In fact as soon as I finish this letter I will go home, not because I feel bad but merely as a precaution. I guess I swallowed too much cold air last night and as a result I am somewhat hoarse. However, it is nothing to worry about.

Otherwise there is very little to write about. Children are doing pretty well and behaving also pretty well. Anita still comes out with pretty funny remarks. When I reprimanded her for some or other she retorted "Well I did not turn out so well" or something to that effect. I do not know how this sounds now but it was pretty funny at the time she said that. She is a very comical character in general.

With further reference to my conversation with Joe, while this matter has not been fully settled, it is on the way and will be handled again through Goldie, as formerly.

It also seems that the Pumpkin man has written another installment of his memoirs for a big magazine. I have not read it as I would not spend a dime or whatever it is for same. You probably saw it and I understand it is quite the thing. He practically refutes the theories of science, etc. Quite a guy he turned out to be. I guess he wants to be immortal and ismaking sure that his opinions are recorded. Besides of course, the fee of something like 75 thousand dollars helps along. He even appeared on the radio and television.

Please get busy for [illegible] writing. Best Regards
Love from [illegible]

Naomi Brothman

didn't qualify for [illegible] institution of higher learning, and he had to content himself with an
mission to an establishment of less rigorous entrance standards, — a disappointment which
sure he keenly feels! [My competence to speak for him, I'm sure you will understand, ari
course from that kinship between us that derives from the fact that both of us had to grop
from Ivy League schools to eventually make this circuit. If indeed my residence in the hall
halls of Columbia University taught me to forever seek the highest realms of attainment in scho
deavour, I'm sure that his tenancy at Harvard, where to be sure there's a bit more of that
ing verdant species of vegetation than at Columbia, must have similarly implanted in him a comparable ad
standards governing his ego-expression.]

And since one thing leads to another, I see by the newspapers that that certain incarcer
gent is now seeking a new trial on the basis of some new evidence. Silly boy! By this time,
have learnt that facts have nothing to do with the facts"! Of like Drool Pearson, I too "predict" that
will come to nothing, for the good Federal Judge who is slated to hear this thing is probably
brighter gent than the character on whose behalf the petition was filed and because of this fact
dismiss the whole thing. I'm sure that this sagacious jurist, who in the first place found it in
with his standards of court-entertained and court-entertainable veracity to listen the Pumpkin
out, will also find that a few additional departure from the truth by that latter speci
really of small consequence; and in this judgement, I too would frankly join him, for what's a
shrift a few extra lies when the Pumpkin Man's whole story was palpably one long orgasm of
and auditory hallucinations.

I'm afraid that the Harvard alumnus will have to complete the course for which he is
rolled; and it may be that it will do him some good, though this latest action doesn't spe
highly for his scholarly aptitude. He's going to have to learn to view the world in less static ter
by less congealed standards. In his day and mine at school, we were taught that fiction
confined to literature and the right to tamper with even normed word-usage required a "poe
licence". Well that doesn't hold anymore! In this more highly-refined culture of ours, in this
all possible civilizations, we've widened the frontiers where fiction is permitted, and when it's
in court its teller, if he's on the right side, is equipped with a new kind of legal privilege
a "prevaricator's licence"; and indeed it's a sorry sort of liar who doesn't make use of this new

Abraham Brotman, 71647

As ever,
Abe

From ABRAHAM BRETHMAN
PMB 71647, ATLANTA, GA.

To MRS. NAOMI BRETHMAN
(Name)

THURS. EVENING
JAN. 31, 1952
(Date)
41-08 42 ST.
LONG ISLAND CITY 1, NEW
(Address)

Dear Naomi,

Since my last writing, I've received your letters of Thurs.-Jan. 24 and Mon.-Jan. 28. In letter of Jan. 28, there came a receipt-slip for your $20 money-order. I thank you from the my heart for this contribution to a "worthy cause"; as to for underlined advice, to her for when the need arises, please be assured that I am afflicted with few if any inhibitions in of soliciting financial assistance, and on that account you would be well-advised to of a cessation of such solicitations. In fact, this inclination of mine to earnestly, persistently consistently request monetary aid, believe me, is one which stands in the least need of coaxing, for it, in common with my other stronger leanings, rests firmly on the on the deepest and of my intellectual convictions.

But to be serious again, Monday's letter thrilled me! I'm very happy that you enjoyed As I've already written, you know that I enjoyed it too. And if I haven't said this before, proud of the way you conducted yourself. I'd like to say more about the visit but I'm still too ecstatic about it to be coherent; and so, until I calm down, let me set it down it still makes me feel good all over just to recollect it.

It's too bad that the weather was so poor while you were here. Though I'm not a the Georgia Chamber of Commerce, I wouldn't be doing right by my present status as a " permit you to go away thinking that Sunday's and Monday's weather is the usual thing it isn't; and there's a little doubt in my mind but that it was some Yankee weather either drifted down here by accident, or was directed here by some subversive plotter your impression of this land of sunshine and a few lesser marks of distinction. I'm sure certain Senator had been here, that he'd join me in the latter notion and probably some account for the whole thing. But what am I laughing at! I'd probably rank high on the names, unless there's a State Dept. official or two around. About the latter, possibility know, for truth to tell even if there were they wouldn't reside here with me unless the had worked them over as one from State Dept. official was. And even in that one case, that

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 3/18/52

ABRAHAM BROTHMAN

100-95068-1 B

(Title of case)

Submitted by Special Agent J.F. Collins

Source from which obained See Serial 770

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

157. Photostatic copy of letter dated 1/11/52 to Abraham Brothman from Naomi Brothman.

158. Photostatic copy of letter dated 1/5/52 to Mrs. Naomi Brothman from Abraham Brothman.

(85)

100-95068-18

[illegible] your letter of January 3rd. I have read it [illegible] very pleased that the work you have been doing is [illegible] and productive. While most of it is not very comprehe[nsible] [illegible] its implications and future uses.

As far as my trip is concerned, I am somewhat at a loss to figure it out at the present time. As I have written you, I will have travel by train - it seems that air travel now is out of question - wea[ther] conditions are bad and then I have no right to worry mother. This mean[s a] long trip by train, which will certainly not stop me. But how to spe[nd] two days in Atlanta and then another day in Washington I do not know. I was planning to take two days off - Monday and Tuesday, but this will permit me to spend two days in Atlanta. Of course, I will write for permission to the Warden but before doing this I intend to get a train schedule from Penn Station tomorrow and try and figure the connections. I am not too anxious to spend any more time in Atlanta than necessary and do not particularly feel like sight-seeing, with all due respect to Atl[anta]. If I could see you over the week-end twice, it would work out all right but I do not think that this will be allowed. At any rate I will have to work it out myself and will of course inform you accordingly in my next letter. Please, if it is at all possible, send out the material as soon as you can, so that if I get to Washington on Tuesday of next week i.e. January 22nd, Mr. Bennett should have it in his possession. I will write to him for an appointment, of course.

I have been told over the phone, that there is a letter from you today addressed to Elsa. I am very pleased with that and much pleased too. While I do not wish to influence you in any way, it is very important to my way of thinking to write to the children as often as possible. I have just heard a few remarks from Elsa to the effect that she has written you twice but has received no reply. It is very hard to impress a child that you cannot write as often as you want to, especially being quite a spirited or stubborn child cannot be convinced of many things and I prefer to leave her alone, if I can at all help it. I find that too much pressure usually results in contrary results. Write them as often as you can and always write a few lines to Anita.

I haven't spoken to Mr. Nielsen for a long time but Mr. Hessin evidently met him somewhere and they had a nice chat together. He mentioned that he has been getting nice letters from you. It is very hard for me to call Mr. Nielsen because I never can find him in his office. On the other hand I do not like to call him at his apartment because his wife is quite [illegible]

I expect to see Goldie over the week-end and will convey to her all your recent remarks, etc. He does not get to New York too often but I will make it a point to see him this time. After all when he does come in to New York there are [illegible] so many [illegible] affairs of his that he has to attend to that his time is limited. I will write to you definitely very soon and let you know of my plans, the best that I will be able to make. I will try to arrange for next week end but do not be disappointed if it will have to be the following one. You know the [illegible] of mice and men, etc. So again with best regards [illegible] from the family, I am

As ever,

NUMBER 71647

NAME ABRAHAM BROTHMAN

If written for one inmate by another enter name and number of the actual writer in space below:

WRITTEN BY

NUMBER

Inmate's name and number must be signed at the bottom of this letter and correspond with that on this coupon.

NOTE: Do not write on reverse side of this coupon.

Letter sent to Following Addr

NAME MRS. NAOMI BR

Street and Number

City LONG ISLAND

Relationship WIFE

DO NOT WRITE BELOW THIS LINE

Last Letter to Same Address

Total Number to Same Address

FPI-LX—11-2-60—1,100M

From ABRAHAM BROTHMAN

PMD 71647, ATLANTA, GA

(Date)

To MRS. NAOMI BROTHMAN

(Name)

LONG ISLAND CITY, NEW

(Address)

Dear Naomi,

Yesterevening I received your letter of Wedn. Dec. 2, and I trust that by the time Anita has already recovered from her battle with the "bug". I'm confident that this is already so somehow Anita to me has always epitomized the quintessence of healthy, happy living; and it's very hard for me to conceive of any "bug" that could be evil enough to want to hurt her for more. It seems to me Anita's innate charm is so great that for her to tame a most ill-intentioned "bug" into docility would be no stupendous task, but rather a routine matter. It's just a shame that Libby had such a rough anti-climax; and it hurts to think of anything that would take her happy smile from her face even for a moment. By way of some compensating moments for her uncomfortable struggle with the bug, tell her that everybody here who's seen her photos — and that means just about 2000 people — has fallen in love with her. One of the quaintest things said of her was a remark by a country-boy who said that "she's got plenty of 'tickums' in her eyes". [A 'tickum' is most likely a contraction of "ticklers" and probably connotes a coquettish quality.]

With this blend of a fervent prayer that all is now well with Libby and my confidence that you've everything under control, I turn to a request you made of me some time ago, namely that you'd like for me to comment on some of the more interesting items appearing in the newspapers and periodicals. Just such an item of interest appeared in the "Times" of Sunday Dec. 30, and it concerned the pioneering experimental work of the Argonne "nuclear reactor to electricity. The quality which made this article so appropriate for comment by me was not the noteworthiness of the achievement nor the fact that I predicted it to you some years ago, but rather as a demonstration of the art of "secretion".

A "breeder" reactor is a flamboyant name for the type of U-238 & Plutonium-239 fuel element used for a maximum neutron economy efficiency. As you may remember from my previous explanation of fission, it's the process where energy is obtained from a controlled disintegration of U-235 atoms. But to convert the non-fissionable U-238 to the man-made and fissionable element Plutonium-239 is the key to prompt the desirability of such a conversion — (a) the fact that the naturally-found fissionable U is present in very small concentrations (about 0.7% by weight) in normal uranium ore, which ores are at

FD-141
(7-1-48)

BULKY EXHIBIT

Date received 6/12/52

ABRAHAM BROTHMAN

100-95068-1B
(Title of case)

Submitted by Special Agent J. L. Collins

Source from which obained See Serial 774

Address

Purpose for which acquired Investigation

Location of bulky exhibit In cabinet with file

Estimated date of disposition To be decided at conclusion of case

Ultimate disposition to be made of exhibit Retain

List of contents:

159. Photostatic copies of letters received by subject, Brothman, at the U.S. Penitentiary, Atlanta, Georgia.

(86)

100-95068-1B

Patricia Markham
PMB 11641, Atlanta, Ga.

[illegible]
[illegible]
[illegible]
[illegible] 21, 93

Dear Pat,

I am not, this time, trying to explain [illegible] sorry for not meeting you before. I start on by saying that I've been going in circles with my mind many times and many incidents and appointments. I shall talk more when we meet in New York.

It seems almost certain that I must be accepting appointment at Bellevue Hospital. This is, to me, the difficult and challenging position of the two I have to choose between and my mind wavers, as it has for a lot of the year. Then, I must have to look for some [illegible], again. My family has also expressed their preference to stay in New York, on the condition that we are able to find an apartment near the hospital. They thought the city unbearably hot that I must [illegible] me as often possible as much as possible. As soon as I can find a place to live, I shall resign from my present position. Dr. Hamard Reed as a kindly experienced light in having me on the staff. He seems to be the type of a personality I want to work with, because he has an intensive drive to help his patients and he has a healthy interpretation of the chaplain's work.

In making this decision you also came into the picture. I am fully aware of the fact that I have not been as much help to you and your family as I wish I could be while you have been away. Now

[illegible] friendship has developed into a mutual [illegible]
[illegible] I am looking forward to the day when we can
[illegible] each other in New York as you at the pre-
[illegible] may meet your friends in the prison yard. Mis
[illegible] me much about your experiences. I have met the
[illegible] and it has always been under some mo
[illegible] circumstances. In spite of this I have alw
[illegible] you have a genuine warmth for people, an
[illegible] trust others. I like your deep concern for ge
[illegible] men as you relate much that lies behind the
[illegible] bars. This season I look to receive many of your
[illegible] letters. I don't wish to send like a sentimental fo
[illegible] are in dire need in this circle of my apprentic
[illegible] have very real understanding and feeling for
[illegible] within you must be. I'd like to see you frequent
[illegible] Thanks for your card it is a strong mutual f
[illegible] me to know you may write when you can expec
[illegible] I'll not be a free man. I think you misunderstood
[illegible] in my letter. P.S.

I must also add that my stay in New York will give me
opportunity to continue with the doctor for make ge
[illegible] I must keep his diet in mind the first cake f
[illegible] by herself. It made the only cake I did not like,
[illegible] it came out and ate it. She is a great compan
[illegible] like mine. Has greetings to you. We love my
[illegible] day.

I hope you are able to keep up the good spirit
[illegible] in your letters to welcome and your
[illegible] by. With heartiest greetings, until then remain

Chaplain Ogram J. Mieland Ogr
Norwegian Lutheran Hospital
4520 4th Ave Brooklyn 20, N.Y.

To: Abraham [redacted]
From: Naomi [redacted]

Friday
May 9th

Dear Abe:

Received your letter [illegible] Thursday and was very pleased to have answers to my questions even before my letter reached you. I am very glad that you are getting along in sports and otherwise. I was also glad to see that you have been making resolutions about acquired habits and that you intend to continue xixx to live with them in the future. These are very encouraging news as you know how strongly I feel about these things and how much I have talked and about them in the past.

I was also pleased with the promises you made to Anita and and also hope that you intend to honor them in the future. I have wanted to write and to talk to you about these things before but unfortunately, when I saw you, we never had any time. I have always wanted to bring it up but somehow never did do it. As you have now pleaty of time to think things over, you must recall a lot of situa and many conversations that we have had in the past about personal matters, which I believe, I was on the right track and not you. You must realize that you can rationalize and verbalize much better than I and, while you never convinced me that I was wrong, things went o the way you were shaping them. Of course I realize the cause of all but still in all, certain situations will have to be changed and elim Unfortunately we cannot go into this in our letters and I do hope th we will have time to discuss it next time when I see you. But in th meantime I do hope you will give it consideration as I am sure that you are well aware of what I mean. You remember the song you used to sing about "resolutions on paper". Well another dictum of yours was always about theory and practice. So I do hope that all your theoretical resolutions will have practical applications and that yo are making plans along these directions. I do not want to go into this any further and have only written the above because you gave me an opening about your habits and about your intentions to live with the better ones in the future.

I saw Mr. Nielsen yesterday and have conveyed to him what we have discussed. I think that for the present it would be best th he writes first. Then this can be followed up by a visit, if necess What do you think about it. He will write you directly.

I spoke to Clara yesterday too. She has received a letter from you and has written you this week in reply. I am arranging to see her in the very near future that I am able - so that will take care of your request.

I know that there is a letter at home from you - probably of last Sunday - I will answer same during the week-end - probably tomorrow, I hope. Otherwise, there is nothing new to write - the children are all right and busy. Otherwise there is nothing new to write about. I am still, as always, attending to everything th is to do and wil keep you posted about any new development.

So again with Best Regards and love from the Family, I a

As ever

FD-...
(7-17-52)

BULKY EXHIBIT - INVENTORY OF PROPERTY ACQUIRED AS EVIDENCE

Bufi... New York Field Division

Various Date

Titl... and Character of Case:

ABRAHAM BROTHMAN
100-95068-1B

Date ...roperty Acquired: See below

Sour... From Which Property Acquired: See below

Loca...on of Property or Bulky Exhibit: In Vault

Reas... for Retention of Property and Effo...s Made to Dispose of Same: Evidence & Information

Desc...ption of Property or Exhibit and Iden...ty of Agent Submitting Same: See below

160. ...ne photostat of letter from Subject to Chaplain E.B. NIELSEN, 8703 3rd Ave., ...rooklyn 9, NY dated 7/10/52. - See serial 780

87

100-95068-1B

SEARCHED ..... INDEXED
SERIALIZED ..... FILED
SEP 30 1952
FBI - NEW YORK

Fie... File #:

From ABRAHAM LEVITHMAN — THIRD EVENING

PMB. 71647, ATLANTA, GA. — JULY 19, 19-- (Date)

To CHAPLAIN B. B. NIELSEN (Name) — 8703 - 3 AVE BROOKLYN, 9, NEW YORK (Address)

Dear Bjorn,

It's my guess that by the time that this letter arrives, [illegible] vista. I hope that she'll have just the kind of a summer vacation that she's [illegible] as my hope that a child [illegible] for her.

I'm mindful as I think of Evelyn Louise off on her vacation of the two summer [illegible] country that I had as a child. I thrill to the recollection of those events today [illegible] they stand today in a different framework of experience than they did then. What was a matter of [illegible] vastness then is a matter of humor today; and what only vaguely troubled me then stands out [illegible] set relief today.

From the soot-laden air and the nondescript greyness of a New York ghetto to the [illegible] and the rich greenness of the countryside was a bigger leap than the four hours that [illegible] told of. Only a journey thru celestial space could encompass such a change; and so our [illegible] for the voyage were certainly no less in scope or magnitude than those Peary had made for the [illegible] the Pole. All things were taken into account :- the possibility of a monotonous change [illegible] a first-aid kit to deal with bloody emergencies; and of course an ample supply of sandwiches [illegible] a thermos-jug of coffee. This [illegible] dish', a water supply [illegible] dimensions accompanied us in the baggage-car of the train. This latter 'supply dump', packed [illegible] dozen borrowed travelling-grips and an ancient trunk that happened to belong to us, took [illegible] to account; everything that the imagination could conjure up. And the imagination of a ghetto people in a big city knows no limit!

A thousand years of adventure were crowded into approximately five hours - a ferry-boat to a distant land known as Weehawken, New Jersey; and then an honest-to-goodness [illegible] a locomotive-powered train belonging to the ostentatiously-named New York, Weehawken, and [illegible] Our destination? A frontier-land in the Catskills, Ellenville by name. Even as I write of [illegible] seems to me that I can still feel the sweep of the wind against my face as I stood on the [illegible] point on the ferry-boat's deck. A month of anticipation of this journey and the narrating [illegible]

excitement that acc[ompanied] ranked the approach of D-[illegible] turned the hot New Y-k August e[vening] in Arctic blast. In my vivid imagination, I steered this mighty ocean-prowling luxury [liner] into its home-port at Weehawken with bold twists in this and then in that direction of [the] In that ten-minute ride from West 42 St. to Weehawken, all of the rides I had previously [taken] on the top-deck of a double-decker Fifth Avenue Buses in their totality were dwarfed [into] insignificance. Nor was a boat-ride on the main Central Park lake to be compared to this o[ne] on the vast expanses of the Hudson River! The ghetto knew a boundary, I had learned a[t last] and that horizon lay at West 42 St. in Manhattan.

In the years since this event took place, a mighty torrent of hours and pages have be[en] in an almost never-ceasing endeavor to place the concept of the 'infinite' within an ultim[ate] finition; but even today I've nothing but a few devices-of-mathematical convenience by which to this momentuous projection. But what has for good and sufficient reason escaped my (and e[very] else's) intellect as a hard and fast physical concept has been known to me on an intuitiv[e] ever since the day I boarded the country-bound train at Weehawken. An eternity, an infi[nite] time, is still the length of time it took for that train to get started. I can't remember much [that] happened from then on until we arrived at Ellenville because a cruel fate, in my everlas[ting] grin, caused me to fall asleep on the train; and, tired by the accumulated nervous strains [of] slumbered almost all of the trip. But Ellenville will always stand for me as my first rendezv[ous] with extravagance, for it was at Ellenville Station that we sent a telegram to my Father ass[uring] him we had safely and soundly survived the rigours of our ghetto-shattering journey. The Br[ood] — Mother, daughter, and son —, carefully worded a message to be shipped across the long li[nes] up until that moment had — so far as we knew — served only the whims of the makavajahs of [high] finance.

I was destined in the years to come to roam (some goodly portion of) the skies of two hemispheres, and — in some almost all of the ghetto's chains have since been broken; but the day on which I first slipped [the] the ghetto's fortress walls still lives on with a freshness I guess it will never lose.

A 'bon voyage' to Evelyn Louise, even though a belated one, and my very best wishes [to] you and Mrs. Nielsen for the happiest kind of a summer! I hope that these reminiscences [have] bored you. In an indirect way, they'll at least convey why I've always hated poverty and p[overty] residence, a ghetto.

Abraham Brotman, 71647 Yours-in-friendship,
Abe